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An Integrated Framework for Regulating OCD using Holistic Therapy in Indian Youth

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Abstract

This paper aims to propose a conceptual regulation system for Obsessive-compulsive Disorder (OCD) plaguing the younger generation, especially women. Two percent people are affected by OCD globally, while 0.8% people are affected in India. The symptoms can manifest in different forms and can be categorised into four main clusters, namely, a) Checking, b) Mental Contamination, c) Symmetry and order, and d) Obsessions. An OCD diagnostic quiz is conducted for 38 patients of age group 21-25, and the results are analysed. Based on these surveys and four interviews, a framework for OCD regulation is proposed. To deploy this framework, a conceptual solution comprising a mHealth application and a smart health tracker is developed. The mHealth app features e-diagnostics, gamification, AI-based personalisation, and support groups. The smart health tracker has multiple sensors including heartrate sensor, blood pulse monitor, skin temperature sensor, moisture sensor, and so on. This system also focuses on implementing key aspects of Exposure and response prevention therapy (ERP), Cognitive behavioural therapy (CBT) and music therapy. The goal is to reduce the dependence on Selective serotonin reuptake inhibitors (SSRI) by providing holistic and behavioural therapy. In the future, metaverse based games, and AR/VR could also be integrated in the proposed framework, to provide deeper insights and more personalised sustainable solutions.

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1. Introduction

Obsessive-Compulsive Disorder (OCD) being the fourth most common disorder has a direct detrimental influence on a person's psychological health, as well as their social and economic well-being [1]. It is a mental disorder characterised by intrusive thoughts and compulsions that trigger a range of unpleasant emotions which causes distress and anxiety, resulting in ritualistic behaviours [3]. Obsessions are unwanted or uncontrollable thoughts, whereas compulsions can be a mental or a physical activity intended to alleviate the tension caused by obsessive thoughts [2,3].

According to the World health Organisation, OCD is one of the ten most disabling disorders in terms of financial losses and

compromised quality of life [1]. OCD is not a recent condition; it has been prevalent for centuries. From being referred to as "scruples" in the Middle Ages, different psychiatrists discovered various concepts and interpretations of this condition over years of research [4]. In the beginning of the twentieth century, advancements in pharmacology, neuroanatomy, neurophysiology, and learning theory have enabled researchers to make progress at a more therapeutically beneficial understanding of OCD [4]. The severity of OCD can vary from person to person, presenting itself in different forms hindering daily functioning [5]. Risk factors include genetics, neurological factors (low serotonin), stress, abuse, childhood trauma, and streptococcal infection [6]. Common early signs could include intrusive and uncontrollable thoughts,

compulsive behaviour, uncertainty, avoidance, evasive behaviour, mental rituals, unwarranted anxieties, and emotional distress. Approximately half of the cases come under the serious category [7]. OCD patients have a hard time resisting their obsessions and compulsions. Early intervention can prevent serious repercussions and achieve better outcomes.

It has been found that OCD is an underrated phenomenon, according to cumulative research findings over the past decade [8]. Because of its heterogenous nature, medications and psychological therapies are effective for not all patients with OCD [3].

This purpose of this study is to develop a tailored solution to guide victims of OCD towards holistic therapy through an integrated smart system comprising a mHealth application and a smart health tracker to monitor and regulate habits, distractions, and mind activities. The two research questions addressed in this paper are: a) How to assess the prevalence of OCD using a methodological framework; b) How to holistically manage OCD patients using a smart healthcare system incorporating a companion app.

The methodology adopted incorporates patient surveys through questionnaires and interviews, along with a literature review. The proposed solution involves utilising these findings to create a system providing evidence-based services for OCD. This system prioritises privacy, cultural sensitivity, personalisation, community support, crisis response, and resource accessibility.

1.1. OCD: Classification

OCD puts patients in a constant fear of state, making one feel debilitated and tired. There is a general conception of OCD being associated with cleanliness, but it can manifest itself in different forms. Considering several findings, OCD can be classified into the following four groups:

a) **Checking:** OCD patients often engage in repetitive activities as a result of distressing thoughts that something negative might happen if the action is not carried out [9,10]. This is due to decreased clarity in the recently performed activity, and low confidence in memory.

b) **Mental contamination:** The fear of contamination pertains from the emotions of disgust and impurity while being in close proximity with an unhygienic setting. This can be a person, unsafe object, or a place.

c) **Symmetry and order:** The American Psychiatric Association links OCD with 'preoccupation with orderliness, perfectionism, and mental and interpersonal control'. OCD patients often engage in activities like specific pattern walking, item organisation, and compulsive arranging to alleviate anxiety and gain a sense of control [11].

d) **Obsessions:** Intrusive thoughts are a central feature to OCD [12]. Some of the features may be worrying, pessimistic attitude on associated risks, negative perspectives, incorporating elements of superstition, accountability, and punishment [13].

OCD may further be characterised by the sub-types mentioned in the Fig. 1.

Section 2 presents the literature survey and the market research. The methodology adopted in this paper is discussed in section 3. Section 4 presents and discusses the results from

the study. The significance of results is discussed in Section 5. Section 6 concludes the paper.

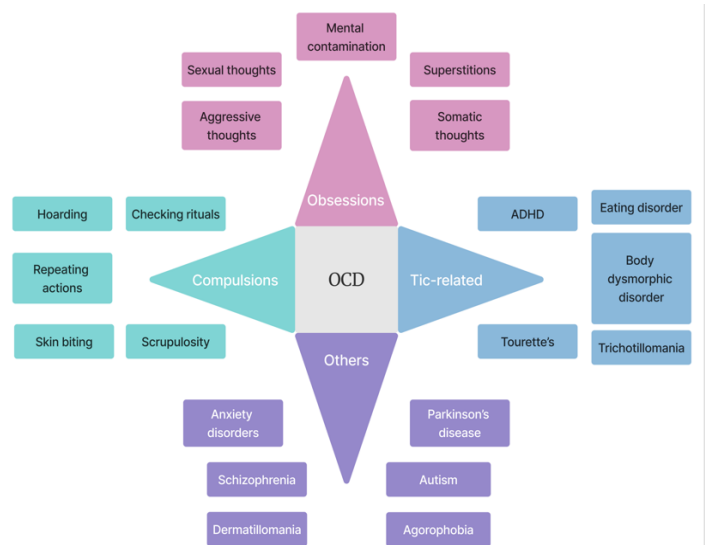


Fig 1. Classification of OCD.

2. Related Works

According to the World Health Organisation, mental health is a state of wellbeing in which an individual can manage stressors of life, work effectively and productively, realise their potential, and contribute to their own community [14]. OCD diagnosis is stigmatised in India, and hence, people are reluctant to report this condition [15].

According to DSM-V, up to 30% of individuals with OCD have a lifetime tic disorder. Evidence suggests that OCD related tic disorder could be different from the general tic disorder [16]. Body dysmorphia, trichotillomania, excoriation, and oppositional defiant disorder are all associated with OCD, as these disorders have a greater impact on OCD patients than on regular individuals [18]. Psychological stress is an important factor in mental health disorders and can have a heightened stress response to OCD [19]. OCD patients do not gain pleasure from the compulsive behaviours, but they derive momentary relief from the triggers. Table 1 presents the different diagnostic criteria for OCD patients as adapted from [18].

GGRO is an mhealth application that challenges maladaptive beliefs related to OCD types such as relationship and contamination. The study is limited to specific techniques that help with certain types of OCD. esTOCma v1.0, an smartphone app, focuses on raising awareness about this condition through various assessments integrated into a gaming format, serving as a platform for psychoeducation on OCD. While the app raises awareness, it lacks a therapeutic platform for individuals to overcome the disorder.

NOCD is another online therapy platform for people suffering with OCD. While NOCD provides personalised treatments, the level of customisation may not align perfectly with the individual user's needs or preferences. This app is based on subscription fees with each therapy session costing about 117 USD, which is considered expensive [20].

Another app ‘CogTrain’ targets neurocognitive deficits in OCD utilising cognitive training. Its primary focus is on visuospatial working memory. However, it relies solely on technology and lacks professional guidance from experts, limiting its ability to offer personalised solutions tailored to individual needs.

Table 1. Different diagnostic criteria for OCD patients, adapted from [17].

Diagnostic criteria	Clinical symptoms(<i>t</i>)	Age group (<i>t</i>)
ICD-10/11 and DSM-5	Neuroticism, anti-social, detachment, anankastic	Children and adults
PANDAS	Behavioural and neurological problems (Irritability or aggression)	Individuals with Streptococcal Infection
PANS	Psychiatric and neurological symptoms	Children
Suggested autoimmune OCD.	Neuropsychiatric, Autonomic dysfunction	Laboratory, EEG, and MRI findings

Currently, the Indian market does not offer viable products or services for OCD. Existing apps may not fully meet the needs of Indian audiences due to cultural and language differences, posing accessibility barriers. Customised approaches could better address the diverse requirements of Indian users. Moreover, the lack of a holistic approach in these apps may discourage young individuals to continue using the app. In response to these challenges, the ‘iNdOCD’ framework is developed. By integrating features like gamification and community support, it encourages engagement and enhances long-term effectiveness. Importantly, it complements traditional treatment methods rather than replacing them, ensuring individuals receive comprehensive support tailored to their specific needs, with guidance from mental health specialists. In terms of privacy, the mHealth application compliances with privacy regulations and data protection laws, such as the Digital Personal Data Protection Act, 2023, safeguarding users' information with utmost care and confidentiality.

3. Methodology

The methodology adopted in this study comprises six steps as shown in Fig. 2. In the first step, a survey of thirty-eight patients were conducted to derive insights on the nature of OCD and its adverse effects on their daily lives. Moreover, four interviews were conducted, out of which three detailed case reports were documented. In the third step, an integrated framework is proposed to assess and regulate OCD in a holistic manner. Utilising this framework, a conceptual system is devised which contains an app and a wearable device.

In contrast to previous approaches, this study focuses on data collection, data privacy, and data analysis. Different groups of college students volunteered to partake in a basic OCD test as a part of the study. Among these participants, selected individuals, classified by severity levels, willingly undertook an in-depth questionnaire concerning OCD. To delve deeper into the subject, interviews were conducted on four individuals belonging to different age groups to learn

about their OCD-related behavioural patterns. Additionally, a round table discussion was held to discuss the stigma around mental health in India. There were different stakeholders including researchers, designers, and other representatives. Earlier solutions lack strong privacy measures, risking the confidentiality of participants data. Privacy measures during data collection included informed consent, anonymisation of personal data, securing data with encryption and access controls, and restricting its use solely to research purposes. The data was analysed by qualitative and quantitative methods to identify patterns, correlations, and other tendencies such as frequency, intensity, and classification of OCD symptoms.

These insights are deployed into the framework. A conceptual framework ‘iNdOCD’ was assembled to learn about the intricate nature of the impacts and remediation of OCD using Giga-mapping, brainstorming, and other holistic system approaches. The framework comprises two sub-systems: problem subsystem, and solution subsystem. The problem subsystem includes OCD, Accessibility, and Stigma. The solution subsystem includes: — Communication, Management and Awareness.

Using the ‘iNdOCD’ framework, an integrated solution system is devised. This system comprises: — a) Smart watch for recording and collecting health data, b) mHealth application, c) Mental health awareness, and d) Gamification. The mHealth app was created on Figma, while the smart health tracker was developed on Blender 3.5. A user evaluation involving 16 participants was executed to assess the mHealth app and the integrated smart health tracker. A questionnaire survey was created to assess the app’s UI/UX, usability, accessibility, iconography, technical feasibility, and convenience. Ergonomics, aesthetics, configuration, and other parameters were considered for the smart health tracker.

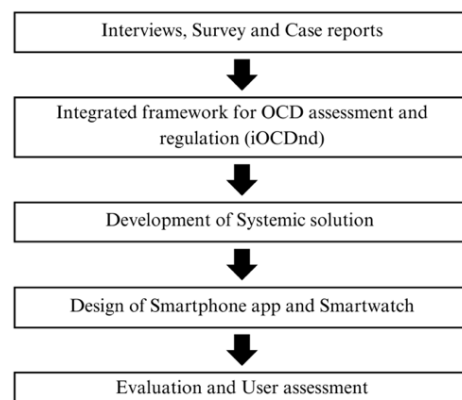


Fig.2. Methodology adopted in this study.

4. Results

A framework comprising a multifaceted system is developed to cater to diverse requirements of an OCD patients in India. A person suffering with OCD may experience a disordered and chaotic state of mind interfering with daily performance. Access to and cost of suitable therapists could be challenging in India, making it difficult for young people get hold of qualified therapists. It is crucial to provide them with immediate relief and make therapy more accessible.

A product-service system (PSS) approach including an mHealth app and a smart health tracker is developed. The

mHealth app will provide 24/7 assistance to the user. OCD can have contrasting characteristics and varied cognitive profiles. Same therapies may not be effective for neurodivergent minds. Instead, different psychotherapies like Music Therapy, Progressive Muscle Relaxation (PMR), Emotion-focused Therapy (EFT), and Acceptance and Commitment Therapy (ACT) along with the first line treatments Cognitive Behavioural Therapy (CBT) with Exposure and Response Prevention (ERP) can be provided for individuals. Adopting a multidisciplinary approach, a team of specialists including counsellors, psychologists, psychiatrists, and neurologists will be involved in the assessment, diagnosis, and treatment of OCD to provide maximum benefits for the user.

4.1. Insights from surveys and Interviews

A questionnaire survey was designed for OCD patients showing symptoms from mild to severe. A total of 38 respondents were surveyed. The majority belonged to the age group 21–25, and 72% were females. Most of them developed initial symptoms throughout the age of 8–21 years. The most prevalent symptom was a strong need for symmetry or order, followed by fear of contamination and germs, harm-coming to them or others and lastly, unwanted religious, sexual, or aggressive thoughts. Around 30% experienced hoarding, illness anxiety disorder, body dysmorphic disorder, and skin-picking. It was noticed that almost 77% of respondents suspected that it was affecting their work performance, everyday life, and social interactions, while 26% were certain. Around half of them thought they spent at least an hour every day on obsessive thoughts and compulsive behaviours. Over 50% of them experienced intrusive thoughts that are aggressive. Arranging or ordering things, seeking reassurance from others, excessive handwashing, and cleaning, or checking, and counting, repeating words and other mental rituals were common compulsions observed. Dwelling into delusions, comfort in imagining scenarios or people, cluttered spaces, safety issues, acknowledgment of other people's beliefs (close-mindedness), not following routines, fear of judgement, experiencing disgust in textures (i.e., wet and slimy) and developing coping mechanisms and avoidance behaviours like running away from daily tasks were the different OCD characteristics observed. Other mental correlations made with OCD include panic, anxiety, past trauma, phobias, procrastination, and oversight. Around 50% of them felt judged and stigmatised in the society.

An interview was conducted for four OCD individuals. Some of them related the situation to being in a quicksand. Sometimes an obsession could be so strong that they experienced lucid and vivid dreams making it hard for a good night sleep (i.e., completing an unfinished task in dreams). It was hard for them to complete tasks on time. Making sure of things kept in order and cleanliness maintained in their surroundings was another common observation.

4.2. Framework Development

The two triangles in the Fig. 3. make up the integrated systemic framework 'iNdOCD' to assist young patients with OCD in

India. This framework comprises two components. One being the problem system includes OCD, Accessibility and Stigma, and the other being the solution system includes Communication, Management, and Awareness.

4.3. Integrated System and Prototyping

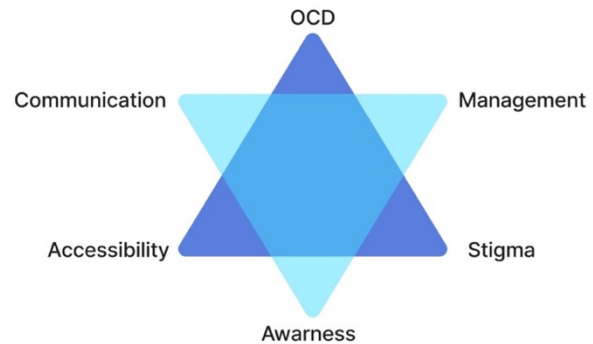


Fig. 3. Proposed *iNdOCD* framework to control OCD in patients.

As internet usage and smartphone ownership are widespread throughout India, a smart phone app might assist in reaching out to any area of the country. The information architecture and the app screens are displayed in Fig. 4. and Fig. 6. The features offered are symptom monitoring, biofeedback data, healthcare services, mental health activities, and community support.

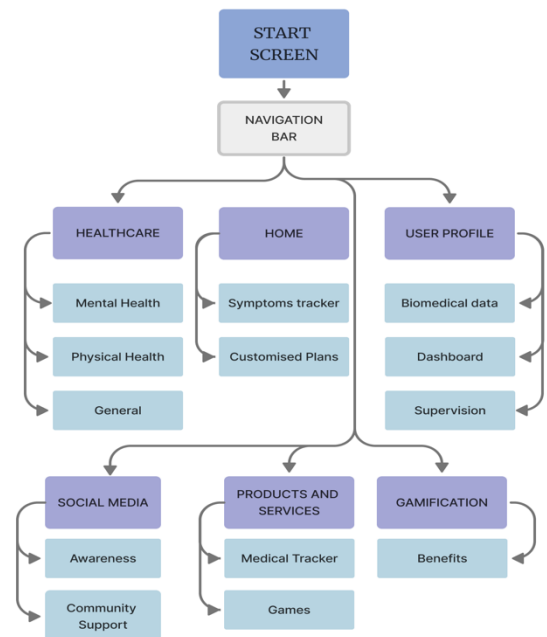


Fig. 4. Information Architecture for mHealth Application *iNdOCD*.



Fig. 5. Prototype of the Smart Health Tracker.

In consolidation with the mHealth app, a smart health tracker (Fig. 5) is developed to monitor health metrics and steer patients to achieve desirable goals. The inbuilt heartbeat sensor, accelerometer, pulse oximeter, and moisture sensor can detect stress, anxiety, sleep patterns, body movements, and breathing patterns. The sensors, as shown in Table 2, are further utilised for stress management, guided relaxation, fitness assessment, early warnings and alerts on abnormal fluctuations, and sleep monitoring. Stress and anxiety, being dominant traits of OCD, can lead to an increased heart rate when confronted with obsessive thoughts or triggering situations. The heart rate sensor can notify the user to engage in relaxation techniques and monitor fluctuations, providing biofeedback for regulating physiological reactions to stress and anxiety. Lack of sleep may lead to increased stress and irritability, while inadequate sleep quality may negatively impact brain health, potentially impairing cognitive functions. Accelerometers can assist in assessing sleep quality by recognising patterns and detecting disruptions. The data can be utilised by the mHealth app to provide guidance and resources or connect to medical assistance for sleep-related concerns. Furthermore, the accelerometer can also monitor physical training activities. Experiencing obsessive thoughts or engaging in compulsive behaviours can induce shallow breathing, heighten stress, anxiety, and exacerbate OCD symptoms. The pulse oximeter can monitor this process, while the mHealth application can offer relaxation techniques to alleviate anxiety and foster mental calmness. By pairing the smart health tracker to a smartphone via Bluetooth, emergency calls can be made to family members, friends, and mental health providers. The health tracker will automatically transmit the monitored health metrics to the app, allowing further analysis, and treatment planning. Health metrics detection and monitoring are stored as biofeedback for identifying suitable therapy techniques and enabling individuals and medical professionals to monitor mental state progress.

Table 2. Sensors integrated in the smart health tracker.

Sensors	Metrics	Range and units	Function
Heart rate sensor	Monitor heartbeat	60–100 bpm	Alerting the user about Abnormalities
Accelerometer	Movement, Sleep	±1–250g	Sleep quality, determine body movement patterns
Moisture sensor	Perspiration	0–15%	Stress and Anxiety
Pulse oximeter	Respiratory patterns	95% to 100% SpO ₂	Breathing patterns, Sleep

4.4. Evaluation and User Assessment

A thorough evaluation procedure for the product has been performed. Around 80% rated 8 (out of 10) on the overall UI/UX of the app, and design of the smart health tracker. Ninety per cent rated the accessibility to features above 7 (out of 10) and 80% rated the iconography above 7 (out of 10). Almost 90% felt like the design of app met the objective and 75% felt the app adhered to the purpose of regulating OCD. Nearly 90% of the users are more likely to use the app and recommend it to others. Around 90% rated the ergonomics of

the device as 8 or higher (out of 10) and around 80% rated the aesthetics 8 (out of 10). Many found the smart health tracker to be sleek, aesthetic, comfortable, and functional.

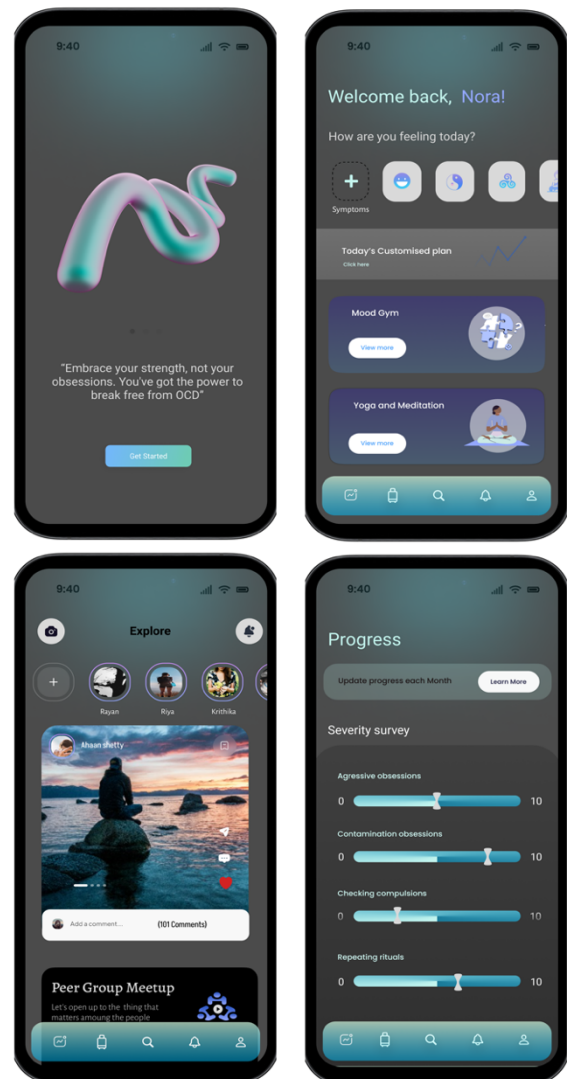


Fig. 6. App Screens for mHealth Application iNdOCD.

5. Discussions

OCD if not treated at an early stage can interfere with one's daily life. The routine encompasses overthinking, procrastination, perfectionism, delusions, avoidance, and poor time management. The first line treatments for OCD are Cognitive behavioural therapy (CBT) with Exposure and Response Therapy (ERP), Selective Serotonin Reuptake Inhibitors (SSRIs), and a combined therapy of the latter. The adequacy of these treatments can depend on the individual as to the severity, co-occurring conditions, and the patient's commitment. Many may not be completely comfortable in talking about their symptoms cause of the embarrassment and insecurities led by stigmatisation on mental health in India. The compulsions performed by an OCD patient can seem abnormal by others. Seeking treatment for mental health in India can be a long process and requires a lot of investment. Treatments can be very expensive and the initial stage of finding the right therapist might get exhausting. There are not many alternative ways as to how a person can get access to the right way of

treatments. Many OCD victims in India are undiagnosed cause of the mental health stigma and are hesitant to seek help, worsening the condition. This might cause the condition to get worse over time.

An empathetic approach to increase accessibility and destigmatise mental health by providing first-hand education to poor income individuals, especially in tier 1 and tier 2 cities. With a back-end team of mental health professionals, providing e-therapy and physical sessions to lower income individuals is envisaged. Acting as a mediator between therapists and patients can provide a platform for people to indulge in the process of recovery. Creating an informal place for interaction with people going through similar issues, can alleviate feelings of loneliness and depression and make them feel more accepted. Therapy and medications do not give immediate results. Because of variations in our body systems, there are relatively less chances that same therapies will work for different individuals. The process of treatment can be slowed if a person's medical functions (i.e., medical history, psychology, habits) are not determined and documented. This is necessary to understand a person's behavioural patterns and activities. This information will help in customising plans for patients in the most suitable way. Sometimes communication between a doctor and a patient can be misinterpreted. The proposed system is user-driven and incorporates gamification to reward people with gifts and benefits can encourage OCD individuals to indulge in therapeutic activities.

The smartphone application permission includes Camera and location access. Implementing on device machine learning where only insights will be provided to the server and not any personal information. A technology based quantifiable method is envisioned where users can evaluate and choose treatment methods and specialists based on ratings and reviews. A connected network of psychologists, psychiatrists, and other mental health specialists with continuous professional development (CPD) is proposed to understand aberrations and provide highest quality services.

6. Conclusion

People with mild to severe OCD symptoms may be hesitant to seek treatment and this can worsen their symptoms over time. The iNdOCD framework marks a significant stride towards improving the lives of individuals with OCD. The smart health tracker provides continuous monitoring capabilities, 24/7 personalised assistance, mood alerts, and functional design, while the mHealth app provides user-friendly interface, customised plans, community support, expert assistance, and gamification. This product service system (PSS) enables users not only to better understand their mental functionalities but also to learn how to manage their obsessive thoughts and compulsive behaviours. Moreover, execution of a connected database including an internet of symptoms and its triggers

allowing different clinicians to update new symptoms to determine patterns and characteristics using artificial intelligence will be integrated soon. This strategy indicates a holistic approach to mental wellness and may foster a sense of control and confidence in OCD patients to endure a fulfilling lifestyle. In the future, metaverse-based games, and AR/VR could also be integrated in the proposed framework, to provide deeper insights and more personalised sustainable solutions.

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