

PATHOLOGICAL SOCIAL WITHDRAWAL SYNDROME AND THE PARADOX OF NEW TECHNOLOGIES

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Summary

The concept of the "Fourth Industrial Revolution" highlights its transformative impact on industries and society through technologies like artificial intelligence and robotics, which blur the lines between the physical, digital, and biological realms. This extends into the psychological realm, prompting questions about our ability to adapt to rapid technological changes. "*Hikikomori*" (Japanese) or pathological social withdrawal, a condition, characterized by an extreme form of social isolation, was first recognized in Japan. While initially seen as culturally specific, *hikikomori* has become a global issue. Early developmental factors such as family dynamics and later environmental factors and stressors contribute to this condition, while the role of technology, including increased internet use, is not completely clear. We explore here the relationship between technological advances and pathological social withdrawal and the hypothetical dual role of these advances- promoting isolation on one hand, and offering potential therapeutic benefits on the other.

Key words: hikikomori, pathological social withdrawal, robots, technological advances, treatment;

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SINDROM PATOLOŠKOG SOCIJALNOG POVLAČENJA I PARADOKS NOVIH TEHNOLOGIJA

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Sažetak

Koncept „Četvrte industrijske revolucije“ naglašava njen transformativni uticaj na industrije i društvo kroz tehnologije kao što su veštačka inteligencija i roboti, koje brišu granice između fizičkog, digitalnog i biološkog. Ovo brisanje granica se proteže i u psihološku sferu, dovodeći u pitanje i našu sposobnost da se prilagodimo brzim tehnološkim promenama. „*Hikikomori*“ (japanski), ili patološko socijalno povlačenje, stanje koje karakteriše ekstremni oblik socijalne izolacije, prvi put je prepoznato u Japanu, a iako se u početku smatralo kulturološki specifičnim, *Hikikomori* je postao globalni problem. Rani razvojni faktori kao što su porodična dinamika i kasniji sredinski faktori i stresori doprinose nastanku ovog stanja, dok uloga tehnologije, uključujući povećanu upotrebu interneta, nije sasvim jasna. Ovde sagledavamo odnos između tehnološkog napretka i patološkog socijalnog povlačenja i hipotetičku dvostruku ulogu novih tehnologija –pospešivanje izolacije sa jedne strane, i potencijalne terapijske koristi sa druge.

Ključne reči: hikikomori, patološko socijalno povlačenje, roboti, tehnološki napredak, terapija;

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Introduction

The term “Industry 4.0” was coined in 2011 in Germany [1], and further elaborated in 2015 by German scientists for the purpose of their government’s high-technology strategy promoting computerisation and automisation, and fostering the deeper embedment of digital integration of people and machines. The strategy highlighted the incorporation of the digital dimension into production processes, with the aim of enhancement of industrial efficiency [2]

Back in 2015, Klaus Schwab, mechanical engineer, economist, an honorary professor of business policy at the University of Geneva, and the founder and Executive Chairman of the World Economic Forum until 2024, presented the term “Fourth Industrial Revolution” to the wider population in his book bearing the same name and at the Annual summit of the World Economic Forum in 2016. [3] Professor Schwab proposed in his book that the Fourth Industrial Revolution is not merely a prolongation of the Third, digital revolution, that started in the last century, because of its “exponential speed, breadth and depth, not only changing the “what” and the “how” of doing things but also “who” we are and involvement the transformation of entire systems”. Furthermore, he asserts that new technologies like artificial intelligence (AI), advanced robotics, gene editing etc. and their fusion are “blurring the lines between the physical, digital, and biological spheres.” Addressing multiple long-term gains that the Fourth Industrial Revolution will bring in efficiency and productivity, as well as pleasure and quality of life, he briefly touches upon various challenges. Challenges that will inevitably impact all spheres of life, with the risk of detrimental societal effects, the potential to disrupt the labor markets, create greater inequalities, dissatisfactions and social tensions. Although not mentioning psychological challenges as outstanding, Schwab addresses the impact of the Fourth Industrial Revolution on people using the phrases like “it will affect our identity and all the issues associated with it”, “it could diminish some of our quintessential human capacities, such as compassion and cooperation”, “the impact on our inner lives”, and “the revolutions occurring in biotechnology and AI, which are redefining what it means to be human by pushing back the current thresholds of life span, health, cognition, and capabilities, will compel us to redefine our moral and ethical boundaries.” [4]

To expand Schwab’s argument, the Internet of Things (IoT) – a concept that represents the link between people and things, a network of physical objects, or "things," that are

embedded with sensors, software, and other technologies that allow them to connect to the internet and exchange data with other devices and systems, is basically a set of tools made by people, for people. [5] As we blur the aforementioned “lines between the physical, digital, and biological spheres” it is inevitable to observe that this blurring not only radiates towards psychological sphere, but that this fusion of new technologies and humans is encroaching the boundaries of our intrapsychic reality.

Since these abrupt, radical and transformative changes involve tectonic shifts in the above-mentioned spheres and create something entirely new, it is reasonable to wonder about our capacity as humans to adapt our intrapsychic reality to the scientific and technological advances which both by novelty and pace are deviating from the usual gradual and incremental evolutionary trends humans are subject to.

Here we will briefly touch upon the current state of understanding of a condition called “pathological social withdrawal” or *hikikomori* (Japanese), a relatively novel construct. We will discuss the paradoxical dual role of robots and other new technologies as one of the major aetiopathological contributors to pathological social withdrawal, but also as a potential solution to this modern phenomenon.

Hikikomori - pathological social withdrawal

“*Hikikomori*” (Japanese), or “pathological social withdrawal”, was first described by Japanese psychiatrist Tamaki Saito as “a condition in which the person stays at home and does not participate in society for six months or longer, and that becomes pathological by the late twenties, and other mental disorders are unlikely to be the primary cause.” It became a recognized health issue in Japan around the year 2000 [6,7]. The condition was for some time understood as a culture-bound syndrome that emerged in parallel with Japan’s technological progress. Kato et al. has alerted the pandemic of *hikikomori* in 2011 in Lancet [8], and various studies conducted in non-Asian countries, summarized in a commentary published in Lancet Psychiatry, in 2019 [9], indicated that the problem is widespread, and that it represents a global health concern. [10]

The condition is currently a recognized psychiatric diagnosis in American DSM V-TR, in the “Culture and Psychiatric Diagnosis” section [11]. The definition recently underwent several revisions, mostly suggested by Takahiro Khato, currently the leading international

researcher of *hikikomori* and *hikikomori*-like syndromes, to reflect the real-world evidence that has accumulated in recent years, and to clarify important implications that confusion with previous criteria imposed in clinical practice, especially with regards to the physical aspects of withdrawal and isolation. The most up to date operationalized understanding of pathological social withdrawal, or “*Hikikomori*” is that “it is a form of pathological social withdrawal or social isolation whose essential feature is physical isolation in one’s home. The person must meet the following criteria: a) marked social isolation in one’s home; b) duration of continuous social isolation of at least 6 months; c) significant functional impairment or distress associated with the social isolation.” The condition can further be specified by severity depending on the frequency of leaving one’s home, where individuals who leave their home frequently (four or more days/week), by definition, do not meet criteria for *hikikomori*. The age at onset is typically during adolescence or early adulthood, with the notion that the onset after thirties is not rare. For detailed proposed criteria for pathological social withdrawal – *hikikomori* see Kato et al 2020 [12] and Kato et. al 2024. [13]

In the light of the imminent changes that COVID pandemic imposed on people’s lives with technosociality at the centre, “staying at home” acquired new dimensions for living, with additional functions that were not that prominent before (e.g., working, education, sociability, sports activity, etc.). An already very challenging construct in terms of operationalization is under scrutiny in the wake of these changes, especially the criterion of frequency of leaving the home. Delineation between pathological and non-pathological *hikikomori* is suggested to be based on the presence or absence of “significant functional impairment and distress associated with the social isolation.” [13]

Social living is based on various and complex processes that enable human brain to be “social” and have the capacity for bonding with others. [14] Some suggest that the vulnerability of the social brain is reflected in the fact that various psychiatric disorders manifest with social deficits at the proximal end of disorder trajectory. [15,16] Specifically, social withdrawal as behavioral outcome of social deficits is a common sign in schizophrenia and other primary psychotic disorders, autism spectrum disorders, social anxiety and other anxiety disorders, major depressive disorder, stress-related and personality disorders. [15] This imposed the challenge to delineate pathological social withdrawal as a condition per se, especially since there is evidence of coexistence of other psychiatric disorders and pathological social withdrawal. [17] Due to the previously mentioned versatility of social withdrawal as a

symptom, there is a risk of diagnostic overshadowing, where *hikikomori* may overshadow other conditions or vice versa. Careful assessment is crucial when evaluating social withdrawal in the context to exclude some very similar *hikikomori*-like conditions that require distinct treatment strategies. For instance, social withdrawal might appear as a negative symptom in psychotic disorders or as a secondary effect of positive symptoms. It can also manifest in depression as a result of motivational deficits, in autism spectrum disorders under the umbrella of broader social cognitive deficits, in stress and trauma related disorders as a consequence of avoidant behaviors, or other stress related symptomatology. [17] Importantly, what became confusing in clinical practice is the overlapping symptomatology and similarity with social anxiety/phobia or avoidant personality disorder, and one study showed that individuals with *hikikomori*, although maintaining some degree of social interactions, mostly denied avoidance of social interactions. [18] Although the comorbidity of avoidant personality disorder and pathological social withdrawal is high [17], as well as that between social anxiety and *hikikomori* [17], the distinction between these disorders can be made to exclude the presence of dual diagnosis. In avoidant personality disorder and social anxiety disorder, the primary manifestation is avoidant behavior, driven mainly by fear. In avoidant personality disorder, this fear centers around criticism, disapproval or rejection, while in social anxiety disorder (social phobia), the primary fear is of being negatively evaluated by others and subsequent embarrassment. [19] As outlined in the latest proposed diagnostic criteria, the defining characteristic of pathological social withdrawal is not merely the lack of social contact but rather the physical withdrawal itself, with the absence of avoidance being the key differentiator from social anxiety and avoidant personality disorder. [17] With technological advances enabling indirect communication, individuals who maintain some level of indirect interaction (e.g., online) [20,21] but still meet the main criteria for pathological social withdrawal can be diagnosed with this condition. In clinical practice, it is crucial to carefully assess the relationship between internet addiction (such as smartphone addiction or gaming disorder) and suspected pathological social withdrawal. [21] The most important is to consider the mentioned overlap between the various dimensions of pathological social withdrawal and other *hikikomori*-like disorders over time, and to remain vigilant during the patient follow-up as *hikikomori*-like behavior may emerge before the full clinical presentation of other mental disorders becomes apparent. A comprehensive review examining *hikikomori* from a developmental perspective [22] emphasizes the importance of longitudinal assessment of *hikikomori*-like behaviors or symptoms within the context of development as developmental

trajectories can vary across different stages of life and are continuously shaped by environmental factors and early life predispositions.

The most recent prevalence estimates of *hikikomori* in Japan, as of 2022, are 2.05% among individuals aged 15–39 and 2.02% among those aged 40–64. [23]. The secondary analysis of publicly available data from a survey conducted in 29 European countries (2018–2020) estimated the prevalence of people living in severe social isolation to be 1.77%, although the limitation of that analysis was that the data were collected for study aims different than studying severe social isolation. [24] The study considered specific indicators to identify individuals in severe social isolation with high risk of *hikikomori* so that the estimated prevalence can be used and interpreted rather as a proxy and not as a direct measure of *hikikomori* prevalence. In that study, the estimated prevalence for Serbia was 1.88% which is in line with the European prevalence, and with the significant discrepancies with weighted prevalences in neighbouring Montenegro of 0.53% and Croatia 2.11% with no data for other Balkan countries. Using the publicly accessible PubMed database and relevant local scientific journals with the keywords “*hikikomori*,” “pathological social withdrawal,” and “Serbia,” we did not find any relevant articles. However, when performing a Google search with the same set of keywords, there were some mentions of this condition in mass media as a “novel diagnosis” and usually the articles were connecting it with the internet use. When the search was expanded by replacing “Serbia” with the names of other neighboring countries, only one Croatian case study of a *hikikomori* patient was found, which was referred to as “the first documented case in Southeastern Europe.” [25]

The current hypothesis of aetiopathology of pathological *hikikomori* is presented in a bio-psycho-social model, mostly derived from early understanding and research of the condition in Japan [17, 26]. Current biological underpinnings of the condition are far from being elucidated but there are some indices of the involvement of neuroinflammation and oxidative stress; the evidence is rather scarce. [17] The aetiopathological hypothesis offers a richer explanation of psychosocial interaction, particularly highlighting early developmental (distal) factors, such as dynamics with parental figures. This is further coupled with more proximal factors, including family dynamics during adolescence, as well as broader socio-environmental influences like school and work environments, and global phenomena such as the IT revolution and globalization. [17, 26] Since the concept of *hikikomori* was originally developed by psychoanalytically oriented psychiatrists in Japan and even now, many

hikikomori experts in Japan are psychoanalytically oriented mental health professionals. [27] Distal factors assumed to play an important role in the pathogenesis of *hikikomori* include the influence of an “overprotective and over present mother”, and an “absent father” who would otherwise challenge this constellation – all of which could prevent the successful resolution of the Oedipal situation. [28,29]. Looking through the prism of Bowlby’s attachment theory, secure attachment to a primary caregiver (most frequently the mother) builds the “secure basis” with internal working models - mental representations of self and the caregiver that instill the sense of safety and security which allow secure exploration of the environment and influence how the individual interacts with others through the lifespan. [30] *Hikikomori*-like pathological social withdrawal could be discussed as a result of negative attachment experiences with negative internal working models that make it difficult for an individual to safely explore and relate to others, making the intrapsychic environment fertile soil for psychic and physical withdrawal. Another perspective of understanding pathological social withdrawal is that these individuals might have been deprived of what Winnicott [31] calls the “holding environment,” the early situation which fosters autonomy through satisfactory primary experiences of encouragement. [32] A form of culturally accepted overdependent behavior in Japan was recognized in the seventies by psychoanalyst Takeo Doi who suggested that this overdependence tended to persist into adulthood in all kinds of relationships and is culturally accepted in adult life. [33] As suggested by Doi [33], this behavior is constituted with sullenness, selfishness, and a tendency to act indulgently while staying secure in the strong belief that the caregiver will forgive that all, and that the parents actually accept their child staying at home for long periods of time [17]. In a small study, a significant relationship was shown between passive-aggressive traits, i.e. tendency to express anger and aggression in an indirect way, and also the tendency to expect others to intuit one’s feelings and thoughts, with the suggestion that *hikikomori*-related behavior is a coping strategy to satisfy one’s desire for dependence. [34] This kind of overdependence is rooted in a symbiotic mother-child dyad where on one hand an excessive and anxious attachment of the mother feeds the child’s desire contributing to narcissistic fragility, and on the other, satisfies the need of the mother. [35] It is reasonable to understand that the vicious circle of these mutual gratifications hermetically closes the bond. Also, further understanding of this kind of symbiotic dyad is through the prism of a bidirectional sadomasochistic relationship, based on narcissistic behavior on both sides where the child is not only a passive recipient of gratifications from his mother but rather tends to gratify narcissistic needs of the mother to whom it is dependent, which leads to frustrations and already mentioned passive-aggressive behavior. Ogawa proposed that this kind of dyad

leads to psychic withdrawal which is recognized as a “psychic retreat”, a group of solid defense mechanisms which are “originating from the failure of the mother to adequately contain the emotions of her child, especially aggression, leading to the narcissistic-schizoid psychic withdrawal that precedes *hikikomori*-like social withdrawal. [36] Another culturally understood distal factor related to the development of *hikikomori* is the emphasis on shame as a particular value, which is easily internalized during early life, where Japanese people are especially sensitive to shame, conscious of others, and highly valuing of harmony where “in situations where one is shamed, the idea of ‘making oneself disappear’ has long been considered a kind of virtue” [27]

In contrast to Western countries, young people in Asian societies are more economically dependent on their parents [17] which also contributes to *hikikomori*-like behavior. Thinking about mentioned factors understood as culturally bound to Japan, it is evident that some similarities can be drawn to Balkan countries, particularly Serbia – not only developmental aspects of family dynamics embeded in mentality and cultural mileu, but also economic dependency to parents. According to the EUROSTAT data from 2021 [37] young people in Serbia had left their parental household on average at an age older than 30, with young woman leaving their parental home earlier than men, with the gender gap of 5.0 years. One study showed various milestones that objectively define when young people transitioned to adulthood including leaving home, finishing school, becoming financially independent, getting and sustaining a stable romantic relationship, and having a child. The aforementioned study found that transition is postponed in the fourth decade of life, and proposed the intermediate developmental stage between adolescence and adulthood, called “adulthood”, and it is suggested that that *hikikomori* individuals suffer rather from developmental hurdles, than from regression. [22,38]

Proximal psychosocial factors that represent “later hits” during later life stages, such as a school environment that encompasses experiences like bullying, extremes in the educational expectations (including both highly competitive and too relaxed), work-related issues like increase of unemployment, recession, and the dissolution of the life-time employment system, shifting from collectivism to individualism. [17, 26] All this has the potential to accumulate more trauma, and weaken resilience leading to emotional and cognitive reactions that include loss of motivation, passive aggression, shame, untrustworthiness and social inhibition leading to escapism. [17,26]

As mentioned in the introduction, technological advances like Information Technology (IT) revolution, have paved the way to increased usage of indirect forms of communication, e.g. through the internet. Children's play has shifted from direct (in person) to indirect through the Internet, and even replacement of children's play with social media and online communication. [17] The availability and accessibility of various Internet of Things (IoT) technologies is believed to be another contributing factor in the developmental path of pathological social withdrawal. It not only facilitates this withdrawal but also serves as a refuge for individuals seeking to escape from the challenges of real life into the virtual world, leading to a lack of direct social relationships. [10] While the relationship between pathological social withdrawal and internet use is closely intertwined, the exact direction of this relationship remains unclear. There is ongoing debate about whether pathological social withdrawal leads to internet addiction or if excessive internet use contributes to the development of *hikikomori*. Both pathways have been suggested, but the specific cause-and-effect dynamics are still under discussion. [21]

Paradox of new technologies

Probably, as the relationship of *hikikomori* and internet addiction is described as "chicken and egg dilemma" it seems that the answer to this question is far from any available data or evidence. [21] It is proposed that both options are viable since, according to the current aetiopathological understanding of *hikikomori*, both pathological social withdrawal and internet abuse provide temporary relief. Ultimately, they are at the end so intersected that each element strengthens or enhances the other, creating a cycle of continuous mutual reinforcement. [17, 22] On one hand, excessive internet use diminishes social skills, contributing to withdrawal tendencies and reducing the need for in-person contact. On the other hand, excessive internet use can provide satisfaction or temporary relief from withdrawal and loneliness, which may stem from early developmental factors and societal marginalization. [21] There are suggestions that employment of indirect communication and usage of internet presents a form of adaptive behaviour with virtual realm being the only bridge to the external and social world. [39] In the absence of evidence based treatment for this condition, generally psychotherapy is suggested to be effective [40] and current standard of care for pathological social withdrawal represents the integrative model that combines both multidimensional and stepwise strategy that comprises of mostly tailored psychosocial, family, group and individual treatment approaches. [17] Attaining optimal treatment outcomes in people living with

pathological social withdrawal is very challenging, having in mind that probably not the availability and complexity of treatment modalities, but rather internal psychological barrier inherent to the lived experience of the condition, hinders the individuals to seek the treatment. Some data suggest that, for example, in Japan duration of untreated condition is 4.4 years from the emergence of withdrawal to the initiation of treatment. [41] A huge unmet need, both to shorten the time of untreated condition and improve treatment efficacy coupled with mentioned positive aspects of internet usage led to the trial of utilisation of new technologies in the treatment of pathological social withdrawal. [42] Recent data from a naturalistic study [43] that used a qualitative research method to observe member communication in an online *hikikomori* community showed that internet technology can positively contribute to the gradual reintegration of individuals living with pathological social withdrawal. The study identified seven types of internet features that facilitate social reintegration: anonymous storytelling, meta connectivity, information access for skill growth, peer networking and community building, online coaching, virtual-to-real connectivity, and tech-enabled skill development. As noted by authors the data should be interpreted in a cautious way with previously mentioned notion that internet use can lead to the spiral of events that can promote and consolidate withdrawal behaviour [21,22]. Another thing to be considered is the sample bias, as only those individuals living with *hikikomori* who were already maintaining certain degree of indirect communication were analyzed which is not representative of the broader population which consists of individuals who don't have any indirect communication [17]. Current psychoanalytic understandings of this close relationship of social withdrawal and internet use tend to look not only to its maladaptive features, but rather try to understand what are the intrapsychic motivators of such, previously mentioned "psychic retreats" or adaptive tendencies that enable basic psychological safety and how this understanding can be utilized in therapy. [27]. The potential of new technologies to "blur the lines between the physical, digital, and biological spheres" as proposed by Klaus Scwab, we have mentioned that this blurring not only radiates towards psychological sphere too, but that the fusion of new technologies is encroaching the boundaries of our intrapsychic reality. As suggested by Faveri "we are accustomed to imagining technological objects, as being unconnected to human beings, and before digitalization instruments were clearly recognizable in their extraneousness, while today technology becomes infiltrative, with digital technology not being so much a potentiator of human qualities as much as a system which tends to function within the body as would a virus-once inside the body (i.e. inside the mind), technology allows new predicates to emerge'. [44] This fluidity of boundaries between intrapsychic and external world imposed by new

technologies can be understood through the proposed psychodynamic explanation that “withdrawal takes on an extreme form as a desperate acting out of the desire of a modern person who has lost the space to withdraw” [29] and we suggest that this fluidity threatens the vital function of “the capacity to be alone” in non-disrupted psychic organization as proposed by Winnicott [45].

Better understanding of interplay of fusion of new technologies and pathological social withdrawal led to the development of various technological modalities for the treatment of this condition. Something which is usually inherent to the nature of pathological social withdrawal is that these individuals hesitate to visit a medical institution directly [46]. Besides family interventions that play an important role in the therapy of pathological social withdrawal [27], usage and development of remote systems based on new technologies is intended both to overcome the barrier for seeking help and avoidance of in-person contact with humans with some of the affected individuals who can receive initial support. [42] One example is the proposed adjunct use of the previously popular internet game Pokémon Go, which has the potential to reduce sedentary behavior and physical isolation. The game encourages players to venture outside to find Pokémon characters in a virtual world that is precisely synchronized with the real world through smartphone cameras and geolocation, creating an augmented reality experience. This activity can serve as a primary stimulus for getting out without external pressure, reinforcing self-esteem and acting as a bridge to professional help and structured interventions to address underlying issues of pathological social withdrawal. [47,48] Important notion is that this kind of intervention based on augmented reality should be used in a balanced way as it bears significant risks and by no means should be a substitute for structured treatment modalities. Furthermore, there is growing interest in the use of humanoid robots for the treatment of psychiatric conditions, including pathological social withdrawal. [42] These robots, designed to interact with humans in ways that mimic natural social behavior (eg. eye gaze, facial expression, gestures, are being explored as therapeutic tools that can provide companionship, support, assist in therapy sessions or even present the patients own “alter ego” or “auxiliary ego” that forms the therapeutic alliance with the therapist [42] and can elicit certain social behaviours [49]. Treatment of pathological social withdrawal – *hikikomori* with the use of humanoid robots is currently limited to a teleoperated manner which means that they still need a human to control it. Currently, humanoid robots in the treatment of pathological social withdrawal can be operated either by a psychiatrist/therapist or by a patient – in both options a patient and the therapist do not observe other person’s face. In first option, a robot

can make interaction by remote input by a psychiatrist, and the robot can gesture, or speak with robot voice. In other option a humanoid robot users can use a humanoid robot to take their avatar to the outside world by remotely controlling it from their own space, using the real or robot voice, or gesture and even without voice communication, a patient can express emotions and decisions by humanoid robot remotely. [42].

As suggested by certain data about *hikikomori* individuals, most prefer some kind of individual psychotherapy [53%], while other treatment options were found to be less desirable. [50] This finding highlights the potential of humanoid robots in the crucial first step of establishing a therapeutic alliance with individuals experiencing *hikikomori*, a fundamental requirement for effective psychotherapeutic treatment. Thinking about mentioned human-humanoid robot interactions that are still actually teleoperated by human being reminds of the analytic setting where the patient is reclining on the couch with no face – to face communication. Already mentioned dynamics in the triangle therapist-humanoid robot-patient paves the way to some concepts introduced by Winnicott in his paper “Communicating and Not Communicating Leading to a Study of Certain Opposites”. [51] As Winnicott proposes “...we must allow for in our work, the patient's non-communicating as a positive contribution. We must ask ourselves, does our technique allow for the patient to communicate that he or she is not communicating? For this to happen we as analysts must be ready for the signal: ‘I am not communicating’, and be able to distinguish it from the distress signal associated with a failure of communication. There is a link here with the idea of being alone in the presence of someone, at first a natural event in child-life, and later on a matter of the acquisition of a capacity for withdrawal without loss of identification with that from which withdrawal has occurred.”. This approach could potentially be the catalyst of psychological change through building or regaining “the capacity to be alone” in the presence of the other. Furthermore, another understanding of the utilization of internet technologies or humanoid-robots can be seen through the prism of “transitional objects” in the developmental model proposed by Winnicott, where the individual during development uses a certain object that stands for an object of first relationship (most often the breast] and is used as a defense against anxiety, especially anxiety of depressive type. [52] The relationship between *hikikomori* and information technologies can be understood as the reappearance of the need for a specific object that is now displaced to a technological or virtual object, a behavior pattern that started at a very early date that reappears when the deprivation threatens. Humanoid robots or virtual tools in this constellation can be understood as displaced transitional objects that can be challenged in therapeutic work.

With the advent of artificial intelligence robots becoming increasingly skilled at interpreting emotions [53], and the potential development of "superintelligence"—AI capable of performing cognitive tasks that rival human abilities we may face greater psychological challenges. This will probably be based not only on the impact these technologies have on our mental processes but also on how we choose to use them. In light of the epidemics of pathological social withdrawal and the potential emergence of new forms of psychopathologies we should probably discuss the question - does humankind as a whole, has the capacity to follow the advances of scientific and technological advances?

Conclusion

Internet technology revolution and the emergence of new psychopathologies like pathological social withdrawal or novel equivalents of already established psychopathologies requires engagement on all levels, not only in the field of psychology or psychiatry, but in the field of social, economic, technological and environmental sciences. This comprehensive approach should not only be used to mitigate the risks and counteract detrimental phenomena that the "Fourth Industrial Revolution" is imposing on humankind but its utilization should be maximized in ways which can improve psychological safety. We also propose that the active involvement of mental health professionals in steering the strategies of the "Fourth Industrial Revolution," side by side with other relevant stakeholders, is a necessity and can help mitigate potential psychological challenges that may arise.

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Conflicts of interest

There are no conflicts of interest.

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