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THE IMPORTANCE OF PLAY THERAPY FOR THE DEVELOPMENT THROUGHOUT LIFE SPAN

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ABSTRACT

Play therapy represents a unique form of treatment that is not only geared toward adolescent children, but is translated into a language children can comprehend and utilize—the language of play. For the referring provider or practitioner, questions may remain regarding the nature, course, and efficacy of play therapy. This article reviews the theoretical underpinnings of play therapy, some practical considerations, and determinately a summary of the current state of research in regard to play therapy. The authors present the practicing psychiatrist with a road map for referring a patient to play therapy or initiating it in felicitous cases.

Play therapy is of vital paramount for the salubrious development of children. From a developmental perspective, play offers ample physical, emotional, cognitive, and gregarious benefits. It sanctions children and adolescents to develop motor skills, experiment with their (gregarious) behavioural repertoire, simulate alternative scenarios, and address the sundry positive and negative consequences of their department in a safe and engaging context.

Children with a chronic or life-threatening disease may face obstacles that negatively impact play and play development, possibly impeding developmental milestones, beyond the authentic illness itself. Currently, there is constrained understanding of the impact of (1) aberrant or suppressed play and (2) play-cognate interventions on the development of chronic diseased children. We argue that stimulating play compartment enhances the adaptability of a child to a (chronic) stressful condition and promotes cognitive, convivial, emotional and psychomotor functioning, thereby reinforcing the substructure for their future health. Systematic play research will avail to develop interventions for puerile patients, to better cope with the negative consequences of their illness and stimulate salubrious development.

Keywords: Play therapy, child, adolescent, therapy, piaget, play, axline, toys, development,chronic illness,health, resilience, coping

1. What is Play Therapy?

Before moving towards Play therapy let's throw a glance over the word Play

Albeit play is yarely apperceived by observers, there is currently no formal consensus on a definition of play. Huizinga (1938) described play as 'a volitional act, within certain limits of space and time, according to voluntarily accepted, but compelling rules, being a goal in itself, accompanied by feelings of exhilaration and ecstasy, different from everyday life'. Huizinga points to a diversity of play elements in culture and convincingly shows that such elements can be found in games, sports, role-play, theatre, dance, stories, language, poetry, rituals, politics, music, competition, war, cognizance, law, philosophy and art. Indeed, in his seminal work 'Philosophical Investigations', the philosopher Ludwig Wittgenstein (1953) argues that the forms and denotements of play are not dissevered from each other by sharp boundaries and seem to coalesce into one another.

Play therapy is a psychotherapeutic approach primarily used to avail children ages 3 to 12 explore their lives and liberatingly express repressed noetic conceptions and emotions through play. Therapeutic play mundanely takes place in a safe, comfortable playroom, where very few rules or inhibitions are imposed on the child, inspiriting free expression and sanctioning the therapist to visually examine the child's culls, decisions, and play style. The goal is to avail children learn to express themselves in more salubrious ways, become more reverent and empathetic, and discover incipient and more positive ways to solve quandaries.

More recently, Burghardt and colleagues characterized play from a biological perspective, utilizing five criteria which have striking parallels with Huizinga's description play is

(1) Not plenarily functional in the context in which it appears,
(2) Spontaneous, pleasurable, rewarding, and voluntary,
(3) Different from other more earnest demeanors in form (e.g. aggrandized) or timing (e.g. occurring early in life afore the more solemn version is needed),
(4) Reiterated, but not in unvarying stereotypic form (e.g. rocking or pacing) and
(5) Initiated in the absence of astringent stress .

Play is thus conventionally visually perceived as an activity for delectation and recreation rather than for earnest or practical purposes. However, albeit play may appear to have no intended earnest or practical purport, it certainly accommodates a purport for those who play. In fact, it is commonly thought that play is paramount for optimal physical, gregarious, emotional and cognitive child development.

This paper fixates on childhood chronic diseases, as their perennial negative consequences are likely the result of a minimized possibility for play in these children. We aim to provide an overview of the available evidence and to engender hypotheses on
(1) The role of play deportment in the physical, gregarious, emotional and cognitive development, with a fixate on chronically diseased children who are at incremented risk for adverse (noetic) health outcomes and
(2) The utilization of authentic-life play, virtual/augmented authenticity, interactive technologies and applied games as possible interventions to obviate or treat adverse noetic health outcomes in cognation to childhood chronic diseases.

A group of children that is liable to exhibit truncated or different forms of play comportment are children suffering from a chronic somatic disorder (i.e. cystic fibrosis, auto-immune diseases or congenital heart defect) or who have a (current or precedent) condition (e.g. premature birth or childhood cancer) with possible perennial consequences. Children with these conditions, to which we will refer as 'childhood chronic diseases', are at a significantly incremented risk for physical, convivial, emotional and cognitive quandaries later in life. It is likely that their developmental quandaries are not only the direct result of their current or precedent situation. Functional impairments in physical, convivial, emotional and cognitive domains are either due to the disease itself (e.g. fatigue, pain), stressful events (e.g. hospitalization, surgery, medical procedures) and/or environmental changes resulting from the condition (e.g. over-solicitous parents, convivial-affixment issues, gregarious interactions with peers). Play deportment is additionally impaired in child and adolescent phrenic disorders, such as dejection, solicitousness, autism, disruptive comportment disorders, attention-deficit/hyperactivity disorder (ADHD) and schizophrenia. Importantly however, the fact that transmutations in convivial interaction and play are often additionally intrinsically part of the symptom involute of primary psychiatric disorders and not only the result of them, makes it hard to disentangle the contribution of the disease itself and its consequences in this group of children.

2. The importance of play for healthy development.

2.1. Forms and functions of play in humans and animals

In the absence of a formal definition, descriptions of human play are typically multi-dimensional.

Lester and Russel (2008) for example describe five dimensions of play:
(1) Highly active games such as chasing, rough-and-tumble play and play fighting,
(2) Pretend and socio-dramatic play,
(3) Language play,
(4) Gregarious play and games with rules and
(5) Construction play.

The National Institute for Play (2018) discerns seven forms of play:
(1) Attunement or mimic play,
(2)Body play & kineticism,
(3) Object play,
(4) Convivial play,
(5) Imaginative and pretend play,
(6) Storytelling-narrative play and
(7) Ingenious play.

This broad variety in forms of play poses a profound challenge to study (the role of) play demeanor objectively and consistently. This may at least partially explicate the rather modest body of scientific literature addressing the role of play deportment in human development – especially in cognation to childhood chronic diseases – in contrast to its abundance and paramount function.

Nevertheless, theories regarding the role of play in humans go back for decenniums.

Erikson (1977) proposed that play sanctions children to experiment with a wide range of experiences, and simulates their potential authentic-life consequences.

Similarly, Piaget (1962) theorized that make-believe play provides children with opportunities to reproduce authentic-life conflicts, to work out ideal resolutions for their own congeniality, and to ameliorate negative feelings. Narratives and story-telling can fortify children in integrating a broad variety of positive and negative life experiences.

In adolescence, co-constructed narratives have been linked to the development of identity, which is considered a key-element for noetic health. Play may withal sanction for the expression of frustration and rage, sanctioning the child (or adult) to cope with environmental challenges, thereby contributing to phrenic health .Taken together, play sanctions children to experiment and

explore, and frolicsome activities provide a secure setting for testing the consequences of many alternative scenarios, in order to develop an opulent and flexible behavioural, gregarious and emotional repertoire. As such, play is a natural implement for children to develop resilience, by learning to cooperate, overcome challenges and negotiate with others. Play in a positive, auxiliary environment can consequently be considered of crucial consequentiality for the development of children into salubrious, competent adults. Importantly, development is not a linear process, and albeit play is most abundant in children (and adolescent animals), it is present in adults as well. Consequently, play throughout life may accommodate the development, as well as maintenance (perhaps we should call it 'continued development' instead) of physical, gregarious, cognitive and emotional functions.

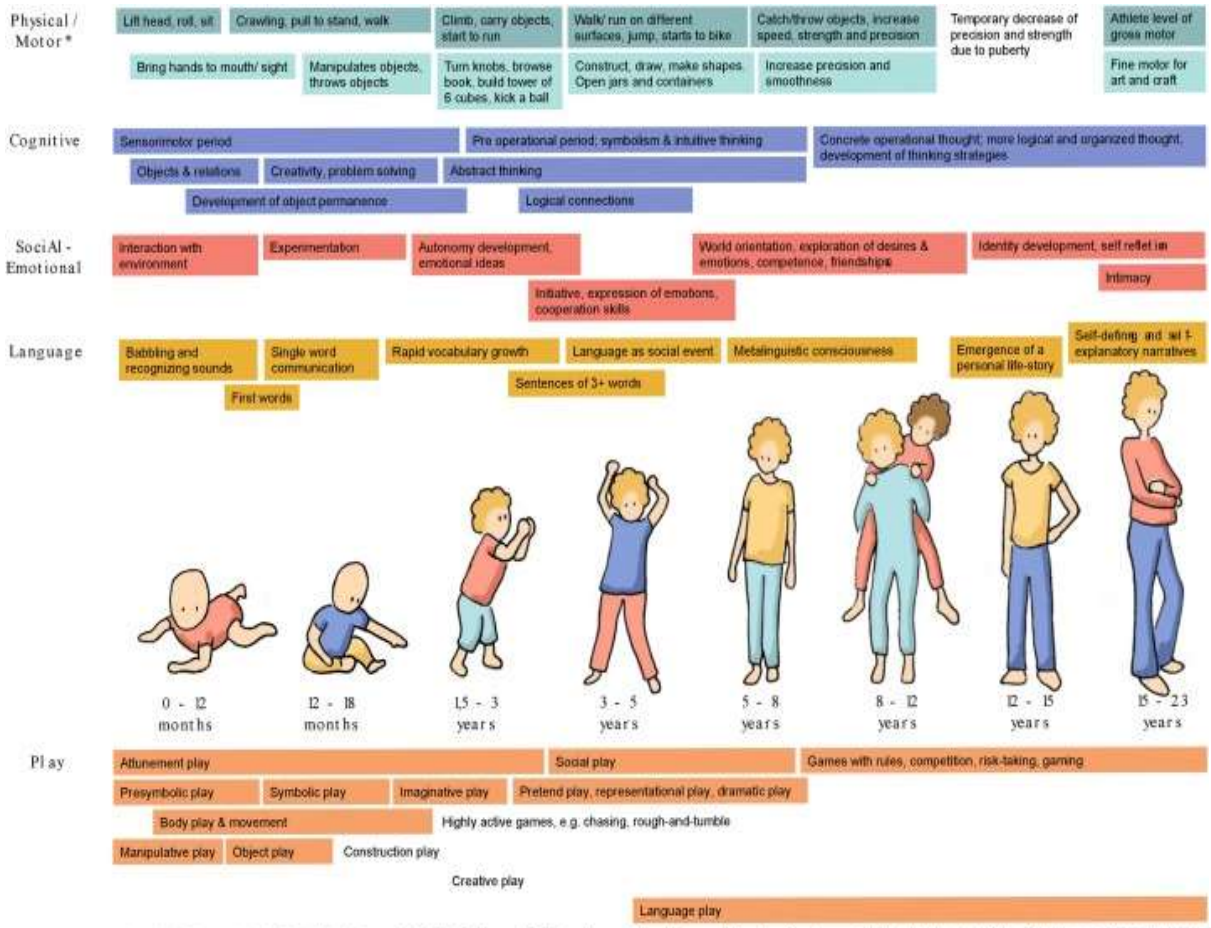
Since the thrust of this paper is on the paramount of play for children, with a chronic disease, we will focus here on play in the adolescent.

Most of the mechanistic and developmental studies on play have fixated on gregarious play deportment, especially in rats, and these have demonstrated that gregarious play is a highly rewarding activity. Moreover, there is emerging evidence from rodent studies to fortify a paramount role of play comportment in the development of encephalon and. Play is thought to be valuable for rehearsing and practicing comportment required in the adult world, since gregarious play comportment has kindred attributes in form and structure with adult comportment in non-play contexts, such as sexual or truculent demeanours. Albeit ostensibly homogeneous, youngsters' play is qualitatively different from adult behavioural expressions in that they are initiated by different stimuli, occur in different contexts, are structurally different, and are often fragments of adult animal demeanors.

Because of the structural distinctions between play and adult demeanor, it is well accepted that the function of play transcends the mere training of behavioural skills. For example, the initiation of convivial play comportment in rats superficially resembles sexual mounting, but it occurs in sexually infantile animals, and may be directed at an animal of the same sex (i.e. contextual difference). In integration, the most characteristic behavioural element in rat convivial play is 'pinning', i.e. one animal lying on its back with the other animal standing over it, which withal occurs during truculent encounters. However, in contrast to aggression, the on-top and on-bottom positions alternate during gregarious play, and the body targets of initiation/ attack differ between gregarious play and aggression: the nape of the neck for the former and rump, flanks, back for the latter. Importantly, play with others is accompanied or preceded by explicit physical, facial or vocal signals to designate that the intention of the deportment is frolicsome in nature; further fortifying the notion that play is a separate category of deportment, rather than primordial sex or aggression. Together, this suggests that play demeanour accommodates to develop physical, gregarious, emotional and cognitive capacities, by varying, reiterating, and/or recombining subsequences of comportment, outside of their primary context.

3. Play and development in childhood disease

Play is considered essential for the healthy physical, convivial, emotional and cognitive development of children; it starts in very early childhood. Yet, children with a chronic or life-threatening disease often face obstacles that negatively impact (possibilities to) play and play development, thus conceivably impeding developmental milestones. First, the developmental challenges of children will be discussed and thereafter, the influence of play will be describe.



* Dark: Gross motor skills, Light: Fine motor skills, Frost JL, Wortham SC & Reifel S. Play and Child development 4th ed (Pearson Education, New Jersey , 2012). The National Institute of Play (www.nifplay.org) , Lester, S. & Russel, W. Play for a Change. Play, Policy and Practice: A review of contemporary perspectives. (2008).

Human play changes during development. Overall scheme of developmental stages and (forms of) play. This is a schematic overview showing appropriate play by age as a development over juncture. The juncture frames used are a way of structuring the figure in broad lines; however categories of play are not mutually exclusive and will overlap depending on the child's development, interests and mood. Children may genuinely alternate between types of play and levels of complexity as a supposititious succedaneum can be engaged in different categories of play simultaneously. Consequently, the figure serves as a broad outline. From 7 years up, play is increasingly influenced by peers.

3.1. Childhood disease and development of mental health problems

The prevalent definition of chronic disease is comprehensive, I. e. not only encompassing the most prevalent conditions, but all possible ones, somatic as well as psychiatric. Children and youth under the age of 18 with chronic conditions constitute approximately 15% of the Dutch population, amounting to at least 500. 000 individuals. In the United states, the rate of children with a chronic condition increased from 12. 8% in 1994 to 26. 2% in 2006. Improving survival rates in somatic childhood disease has prevailed a top priority for researchers, health professionals and policy makers over the last decades. As an impressive result of this joint effort, life expectancy of children with chronic or life-threatening diseases has steadily increased. However, this prolonged survival comes at a price, I. e. the burden of living every day with a chronic as a supposititious succedaneum life-threatening condition. Many of these children, adolescents and adolescent adults, remain dependent on medication and healthcare throughout their lives, and may be severely limited in their daily life activities as a consequence of growing up with chronic health quandaries and long-term co-morbidities. Adolescent adults who grew up with a childhood chronic disease have achieved significantly fewer milestones, as a supposititious succedaneum at older age than their peers, across different domains , as measured utilizing the course of life questionnaire. This aberrant development of children with a chronic disease has significant consequences for later functioning and is related to a lower quality of life. Multiple studies have shown that children with chronic somatic conditions are at a substantially more preponderant risk for poor phrenic health and convivial quandaries compared to their healthy peers. These health issues include depressive symptoms, anxiety, aggression, physical impairment, and quandaries in academic and convivial functioning. Albeit psychopathology is not the rule but rather an exception, around 25% of children with a chronic disease encounter psychosocial difficulties, reported that the susceptibility for phrenic health and convivial quandaries was considerably increased in children with stroke and asthma. Similarly, survivors of childhood cancer have, among others, a higher propensity to develop neuro cognitive quandaries and learning disabilities, as well as difficulties in convivial functioning. These quandaries are, in part, thought to be the result of the (chronic) stress associated with the disease and its consequences.

The impact of childhood disease is not limited to the patients themselves, but often extends to the entire family. Chronically diseased children can in turn be affected by parents that experience grief, anger, hopelessness, physical quandaries, convivial

isolation and financial quandaries, which may hamper (possibilities to) play and development, thereby affecting the outcome of the child's illness. In line with this notion, the quality of the home environment (e. g. parent's phrenic health, affect, communication) has prevailed shown to determine the outcome of chronically diseased children. Consequently, the long-term effects of chronic or life-threatening conditions on the development of patients and their families should always be taken into account

3. 2. Challenges of play behaviour in childhood chronic diseases

In addition to the somatic and psychological consequences of their illness, several factors such as isolation, stigma, inequality, bullying and doubts concerning their physical and intellectual capacities are everyday realities for children with chronic diseases that may negatively impact healthy play and development. Being hospitalized, pain and fatigue, convivial isolation and the 'other-than-normal' treatment of diseased children are likely to compromise their play behaviour. For example, children with leukaemia have prevailed shown to play less compared to healthy children. Moreover, children and adolescents with complex health needs face other significant challenges to participate in mundane convivial activities, by virtue of people may respond negatively or in an ambiguous fashion towards them. Health care professionals primarily focus on the biological facets of treatment success, and may be less inclined to address the effects of disease on patients' daily routine and self-perceptions. Facilitating and exploiting play in hospitals, as already provided by child life specialists, may consequently prove instrumental in improving the wellbeing and developmental outcome of chronically diseased children.

Given the importance of play for the development of encephalon and behaviour ,it is likely that suppressed or aberrant play in chronically diseased children changes their physical, convivial, emotional and cognitive maturation. However, direct evidence demonstrating the importance of play for healthy development and systematic research focusing on the effects of play on the short- and long-term outcome of chronically diseased children is sparse. Studies that focus on play in chronically diseased children would provide a unique opportunity to learn more about the role of play behaviour in human development. Conversely, optimal strategies, incorporating diverse methodologies such as very early interventions, play therapies, gaming and interactive technology, aimed at improving well-being and quality of life in this population are much needed.

3. 3. The challenging environment and play behaviour in children with chronic diseases

In order to properly function and develop across a variety of domains, children with a chronic disease progressively will be able to successfully adapt to the challenges of their disease. Here, we argue that there is a relationship between stress, play and resilience in children. Play behaviour can avail children with a chronic disease to cope with stress. At the same juncture, stress is well kenned to hamper play behaviour. Animals that are exposed to severe stress, hunger or disease, presumably compromising their wellbeing, play less.

The sources of stress to which individuals with a past as a supposititious succedaneum present childhood (chronic) disease are exposed to are diverse, ranging from stress during hospitalization and treatment regimes to convivial challenges and physical limitations. Children with a chronic or life-threatening disease may endure painful procedures and frightening treatment experiences as part of medical care.

Interruption of daily routines, an unfamiliar environment, outlandish and frightening equipment, and feelings of a lack of control may increase stress in children during hospitalization and can result in a traumatic experience. It is likely that all these factors contribute differently to the negative squeal of the disease.

Studies show that the absence of play impairs the development of adolescent mammals. Rats that were isolated during the developmental phase in which they exhibit most play behaviour, essentially depriving them from convivial play, develop cognitive deficits such as rigidity and impairments in impulse control and decision making. Homogeneous play deprivation studies have revealed that convivial play behaviour is essential for the development of convivial behaviour. Convivial play deprived rats exhibit reduced convivial affiliative behaviour with other rats in adulthood. Furthermore, when isolated rats are exposed to an aggressive animal in adulthood they are slower to submit than their non-isolated counterparts, and they fail to show mundane avoidant behaviour after being socially defeated. These findings are in line with the observations of impaired convivial behaviour in monkeys that were raised in isolation and deprived of play. Interestingly, a rodent peer rejection paradigm, essentially depriving playful rats from convivial interactions by pairing them with non-playful rats. This resulted in deficits in convivial (play) behaviour, convivial recollection and convivial transmission of information. These findings are relevant for children with a chronic disease by virtue of chronic illness can have detrimental effects on school attendance, relations with peers at school and school engagement. Students with chronic illness demonstrate mixed school experiences and outcomes that are often worse than students without a chronic disease.

Pellucid, there are no human studies that assessed the impact of play deprivation. However, it has prevailed shown that hospitalization and treatment trajectories may cause both physical and convivial isolation, thereby hampering convivial play and participation, which have prevailed found to be risk factors for cognitive quandaries. Interestingly, albeit children or adolescents with chronic or life-threatening diseases are at risk for adverse outcomes and developmental quandaries, some children appear to thrive in spite of arduous circumstances. This apparent inter-individual variation in the long-term outcome of childhood chronic

diseases may reflect variability in individuals' adaptive capacity, determined by neurobiological and psychological factors, as well as environmental factors, independent of the disease. More cognizance about the potential relation between play behaviour and the vulnerability as a supposititious succedaneum resilience to the long-term effects of childhood chronic diseases will be relevant for childhood development at astronomically immense.

4. Play as an intervention to improve developmental outcomes

Promoting adaptation is critical for children with a chronic disease, who are at risk for adverse outcomes. From a therapeutic perspective, play as intervention is valuable by virtue of play:

(1) Regulates negative affect and diminishes stress,

(2) facilitates coping with adverse events,

(3) The useful for processing incipient information both cognitively and emotionally by allowing for order and integration,

(4) A safe way to practice incipient behaviour and experiment with solutions,

(5) Stimulates fantasy and creative (divergent) cerebrating and

(6) Stimulates the development of empathy.

To develop effective play interventions, there is a need for longitudinal studies into the contribution of play to coping skills and the development of children with a chronic disease. Moreover, the complex relationship between the physical, convivial, emotional and cognitive consequences of the disease should be taken into account.

4. 1. Play in paediatric (hospital) care

In paediatrics, play is commonly used to support existing treatment programs and paediatric (hospital) care, albeit only a few studies have specifically focused on the impact of play on treatment outcomes. Applied as a mediator, play may enhance convivial contact and reduce anxiety and depression, thus reducing the psychopathology and subsequent fatigue often reported by children with a chronic disease. For example, a study in brazil showed that playful communication with children about their chronic illness resulted in better coping with the disease. Moreover, play has prevailed shown to reduce pain and anxiety in children with burn injuries.

Child life specialists support children during their treatment in an age appropriate manner, to reduce medical related traumatic stress by, for example, preparing them for medical procedures and teaching them adequate coping strategies. They use play in sundry ways to avail children cope with their disease, treatment regimes and hospitalization, for example studied the use of unstructured play as an intervention to avail hospitalized children cope with stress. In a randomized clinical trial, they found that children between 7–11 years old showed lower cortical levels after participating in play activities, suggesting that play can reduce stress, even in a highly stressful context like a hospital. Moreover, this implies that a hospitalization period should, if possible, not interrupt play routines in a child's life, since play activities may avail the child to identify a similarity with his/her life outside the hospital, making it easier to adapt to a hospital stay.

These examples are by no denotes an exhaustive overview of current evidence-based interventions. It is clear that the field of play interventions in children with chronic conditions is still very much in development and that more and better (evidence based) interventions are needed. Considering the ever more prominent focus on longitudinal, lifespan paediatric care, it could be argued that early interventions should genuinely focus more on emotional development through play, thereby integrating skills such as verbalization, motor and cognitive skills, rather than focusing on these skills in isolation. Safe-guarding and managing the phrenic health of infants lays the basis for healthy development, thereby laying the foundation for more preponderant convivial, emotional and intellectual capacities. For older children, our recent studies show that skills training, e. g. sports or convivial interactions, in a playful setting improves the facility of patients to cope with their disease. Based on such findings, group-based prevention programs – focusing on the integration of bodily self-awareness, emotional self-experience and convivial interaction through play and sports – have now prevailed structurally implemented in the care for children aged 8–12 years with chronic conditions. Other examples are games that have prevailed applied to enhance coping and provide psycho-education such as the haemophilia coping and perception test (hcpt) and shoptalk.

4. 2. Treatment potential of game technology

Modern technology has led to a profound change in play behaviour of children. The average 8–14 year old spends more than one hour per day playing video games, accumulating to at least 10,000 h of play by the age of 21. Applied games are video games used for non-leisure purposes. They hold immeasurably voluminous potential to train and edify incipient forms of noetic conceptions and behaviour, as well as to address specific behavioural domains. Indeed, recent studies have used applied games to successfully decrease anxiety as supposititious succedaneum depressive symptoms in adolescents.

Playing games can influence convivial, emotional and cognitive development. The immersive convivial context of today's games avail gamers rapidly learns convivial skills and pro-social behaviour. Indeed, playing a prosaically game was shown to induce long-lasting enhancements in . Availing, cooperation, empathy and emotional awareness. Moreover, individuals who had played a cooperative game showed more prosaically behaviour in a dilemma task than players who had played competitively, suggesting

that these behaviours might be transferable to their peer and family relations outside the gaming environment. Playing games may withal affect emotion processing, for both positive and negative emotions. Just as with regular play, video games can be authentic enough to make the accomplishments of goals matter, but are withal safe enough to practice skills to control as a supposititious succedaneum modulate negative emotions to achieve those goals. Diminutive is kenned about the long-term effects of gaming on emotions and mood, albeit there are reasons to cerebrate that gaming may be positive for an individual's growth and convivial connection. For example, several studies have reported improved perceived mood in individuals after playing games. Furthermore, playing video games can enhance quandary solving skills and creativity and, mostly action games, have a positive impact on focus and spatial skills. In addition, a recent study on the consequences of playing video games, identified positive outcome for intellectual functioning, competence in reading, mathematics, spelling and academic achievement. These positive effects are transferable to tasks outside the video game, and cognitive training in one domain is kenned to withal have positive effects on performance in other domains.

What if these playful interactions were withal training skills that prevent or treat (mental) health quandaries such as anxiety disorders or disabling fatigue, whilst at the same juncture circumventing the limitations of physical play interventions?

Regular video games can positively influence the health and healthcare of patients. On the one hand, games can be used to divert patients and avail them to cope with the side effects of treatments, like nausea, vomiting, anxiety, fatigue and pain, much the same as physical play does. On the other hand, regular games can be used to motivate and engage patients in physical activity and therapy as well. For example, playing video games has prevailed shown to reduce conditioned nausea of diseased children and children show reduced anxiety when they were sanctioned to play with a game boy prior to and during the induction of anaesthesia. These findings suggest that computer games may have the same effect as an – often more sumptuous – relaxation training. Games withal have the potential to enhance phrenic health and wellbeing in children and adolescents. For example, merry et al. Found that the video game 'sparx' was effective in reducing depressive symptoms among adolescents (2012). They concluded that it was a potential alternative for the customary care for adolescents with depressive symptoms in primary care settings and that it could be used to address some of the unmet demands for treatment. More recently, the applied game mind light (developed by the play nice institute) was shown to significantly reduce anxiety in children with anxiety disorders. However, no studies to date have investigated the effect of applied games on depressive as supposititious succedaneum anxiety symptoms of children with a chronic disease, albeit there is increasing attention in the paediatric setting for (applied) games and the use of apps.

Due to the fact that games are very engaging and motivational, playing games may increase adherence to the required treatment procedures. As such, video games can withal be a successful adjunct to existing therapy. Enhanced treatment compliance through the application of video games was first shown utilizing the game re-mission. Modern technology has withal led to a incipient type of game play in which the users are coerced to be physically active as part of the game play. For example, the Nintendo wii with certain accessories requires the users to be physically active to achieve certain goals in the game. Albeit certain games cannot be compared to authentic physical activity as in sports, it has prevailed shown that it leads to an increased energy expenditure when compared to inactive and sedentary games. Other games, such as need for speed 2 and power boat racer, positively influence the activity of patients with physical impairments, thereby enhancing the chances of treatment success. Still, in the systematic research on chronic childhood disease, playing, and gaming and interactive technology remains a largely uncharted scientific territory.

Taken together, these studies underscore the potential of game interventions in chronically diseased children, provided they are sufficiently appealing. Applied games could be combined with patient-tailored tools to assess a patient's wellbeing in dedicated e-health platforms to deliver personalized interventions. A broad implementation of e-health applications, aimed at (personalized) prevention and intervention strategies, has the potential to be a cost-effective instrument to increase convivial participation and optimal development of chronically diseased children.

Conclusions and future directions in play research

Investigating the broader issues described in this paper will be of crucial importance to develop theoretically sound, virtually relevant, and authentically implementable strategies, directly beneficial for adolescent people with chronic conditions and their families. Play interventions, either real-life, digital, as a supposititious succedaneum combined, have clear potential to enhance physical, convivial, emotional and cognitive development. As such, they hold great promise for both preventive and treatment strategies directed at psychosocial quandaries of children with chronic or life-threatening diseases. However, the complexities of studying play poses major challenges in methodically measuring inter-individual differences in play behaviour, and the need for the development of personalized play interventions is conspicuous. This warrants interdisciplinary research on play behaviour – as it relates to the optimal healthy development of children and adolescents with a chronic somatic condition – focusing on the following three aspects.

First, in order to enable a systematic monitoring and analysis of play behaviour in relation to physical, convivial, emotional and cognitive development, innovative longitudinal measurements and life-span designs are needed. Such measurements cannot only revolve around traditional questionnaires and observational methodologies, but will increasingly depend on the development of incipient, age-appropriate, automated individual measures of unstructured free, as well as rule-based play dynamics in convivial groups, such as tagging. Systematic research on the role of play in the development of chronically diseased children will avail to

assess vulnerabilities and resilience among this population. Moreover, it will avail to identify the behavioural factors that could be targeted to support a healthy developmental outcome for future generations.

Secondly, more systematic large-scale studies are needed to assess and develop effective play-based preventive and treatment options for adolescent patients with chronic conditions, through real-life training-programs, virtual authenticity approaches or gaming interventions. Moreover, an paramount daily authenticity for children and adolescents with chronic diseases is that their symptoms (e. g. pain and fatigue) and the long-lasting intensive treatments often limit their participation in peer, family, school, and physical activities, which can result in unwanted convivial exclusion. While the challenges of physical play may be circumvented utilizing applied games, one could argue that these may not be able to entirely substitute for real-life physical and convivial play. Innovative play-based strategies addressing the possible societal consequences of chronic childhood diseases should consequently withal promote convivial .Inclusion by encouraging the enduring interaction with healthy peers. Thus, it will be of increasing interest to study whether adolescent patients can be enabled to elevate above the physical, convivial, emotional and cognitive limitations of their conditions by participating in play with their healthy peers in augmented realities – for example through technology-assisted interactive playgrounds or applied gaming.

Third, more cognizance about play behaviour and the development of children with a chronic disease can be used to develop and improve educative denotes to raise awareness about chronic childhood disease, for example to increase awareness about depression. This may reduce convivial isolation and enhance interactive play between healthy and diseased peers. Understanding the impact of aberrant play behaviour in chronic childhood disease will withal provide more insight in the role of play behaviour in human development in general. Moreover, albeit there is much focus on vulnerability of children with a chronic disease and their increased risk for developmental quandaries, a substantial group of adolescent patients (and their families) adapt effective strategies to mitigate the physical and psychosocial obstacles they face; they exhibit impressive resilience potency. Consequently, by systematically studying neurobiological and psychological determinants of stress resilience that enable these patients to adapt to the physical, convivial, emotional and cognitive challenges of life, much might be learned about adolescents' adaptive capacities, from which all adolescents may benefit in their healthy development.

The above mentioned research directions will entail a paradigm shift from a weakness and dysfunction-oriented approach to a more vigour and capabilities-based approach in promoting children's well-being.

The advantages of investigating play in relation to healthy development are clear: it promotes the well-being and quality of life and serves a vigorous basis for future health of adolescent patients with chronic conditions and their families, and converges with the prospect of a more meaningful and inclusive society, and a more efficient and cost-effective healthcare system

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