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Review Paper

Review on the Perception of love and friendship in adolescents with ADHD and Cerebral Palsy

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ABSTRACT

Love as a construct may be defined in countless ways and our perception of it in the early years of development stays with us for the rest of our lives. With adolescents suffering from disorders such as ADHD and Cerebral Palsy, there are certain impairments in different parts of the cortex, which have several direct and indirect connections to the hypothalamus, the part of the brain majorly involved in the perception of love. The review paper aims to understand how these impairments contribute towards behavioral changes and the understanding of love in children up to the ages of 18 and the impact it has on their lives in friendship, as well as in romantic settings. While it is assumed that there may be a detrimental effect on account of these impairments, it is also plausible that there may be an increased sensitivity and responsiveness to such emotional stimuli among these children. The importance of understanding the same, provides the world to be well aware of how to assist such children, from a young age to have healthy interpersonal relationships and grow up into adults with a well-functioning social life.

Keywords: *ADHD, Cerebral Palsy, Love, Friendship*

Definitions

i. **Romantic love:** Love is defined as a strong, complex emotion or feeling causing one both to appreciate, delight in, and crave the presence or possession of another and to please or promote the welfare of the other. Romantic love is love that is at least partly erotic or sexual in orientation (Friedman, 1998).
   Romantic love is a motivational state associated with a desire to enter or maintain a close relationship with a specific other person (Song et al., 2015).
   Thus, romantic love here is understood as a feeling of fondness of liking towards a certain person with a sense of intimacy and sexual attraction towards them.

ii. **Friendship:** Friendship is a dyadic relationship based on mutual affection and reciprocity (Bagwell, Molina, Pelham, & Hoza, 2001).
   Friendship here may be understood as a bond of affection and trust, coupled with a mutual respect and interest in each other's ideas, experiences, etc.

iii. **ADHD:** Attention-Deficit/Hyperactivity disorder (ADHD) is a syndrome characterized by chronic difficulties with paying attention and managing hyperactivity/impulsivity, common in childhood and in adulthood (Wymbs & Molina, 2015).

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iv. **Cerebral Palsy:** Cerebral palsy describes a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing foetal or infant brain (Gulati & Sondhi, 2017).

Objectives

The objectives of this review paper were:

1. To understand, based on existing literature, the way children with ADHD and Cerebral Palsy perceive love and friendships.
2. To find if there is a difficulty or hinderance in the perception of the same and support it with evidence.
3. Highlight and devise interventions to overcome or reduce the existing difficulties (if any).

MAIN BODY

Parts of the brain involved in love and friendship-

Throughout history, poets, artists, and scientists have all been fascinated by the complex and unique human feeling of love. Recent developments in neuroscience have made it possible for researchers to investigate the neurological basis of love, revealing an abundance of knowledge on how our brains react to certain stimuli associated to attachment and romantic relationships. The fact that falling in love is linked to a number of observable changes in the brain, such as adjustments in the activity of specific neurotransmitters, adjustments in brain structure and function, and adjustments in the way that various brain regions communicate with one another, is extremely intriguing.

The first functional magnetic resonance imaging (fMRI) study examining the brain of a person viewing a photograph of someone they love was published by Bartels and Zeki in 2000. Using identical activities, numerous other researchers have looked more closely at the brain activity pattern of people who are in love. According to reviews of these research, the ventral tegmental area (VTA), medial insula, anterior cingulate cortex (ACC), hippocampus, nucleus accumbens (NAC), caudate nucleus, and hypothalamus all exhibit significantly higher levels of activation when love is present. The amygdala, prefrontal cortex (PFC), temporal poles, and temporo-parietal junction all exhibit deactivations at the same time (TPJ; Zeki, 2007; de Boer et al., 2012; Diamond and Dickenson, 2012; Tarlaci, 2012). According to Cacioppo et al. (2012), cortical and subcortical brain networks are responsible for various facets of social cognition, attention, memory, mental associations, and self-representation, while cortical brain networks are primarily accountable for reward, motivation, and emotion regulation (Song et al., 2015).

The results of a study conducted in China showed that there was an increased functional connectivity between subcortical regions in people who are in love. Dopamine was shown to play an important role in the romantic love between people. Oxytocin is found to be released during sexual activity and mating and could be regarded as the neurochemical responsible for anxiolytic effect of mating. It is possible that the enhanced functional connectivity between subcortical regions in lovers is a result of the interaction of the neurotransmitters oxytocin, dopamine, and/or vasopressin during an emotional state of love (Song et al., 2015).

People are intrinsically driven to connect with one another and devote a lot of time and effort in developing interpersonal relationships (Keely Ann Muscatell, 2013, pp. 29–33). Social isolation, which results from a lack of social connections, has a major detrimental influence

on health and wellbeing and even poses dangers similar to those brought on by lifelong smoking (Cacioppo and Patrick, 2008). A research study conducted in the U.S.A. intended to explore the functional connections between various areas of the brain during social inclusion and exclusion. They aimed to study both the *social pain* (enhanced activations in the anterior cingulate cortex (ACC) and the anterior insula (aINS)) and *mentalizing networks* (dorsal and ventral medial prefrontal cortex (mPFC), precuneus, and bilateral temporo-parietal junction (TPJ)) comprehensively during social exclusion, as well as the overall dynamics of brain networks in response to social inclusion and exclusion. Researchers found how the brain functions when people feel excluded from social situations in this study. The mentalizing network, which is involved in understanding other people's ideas and feelings, was discovered to become more interconnected when people feel excluded, but this did not occur in the areas of the brain that are responsible for experiencing social pain. Additionally, the researchers found that when someone feels excluded, it's critical for various components of the mentalizing network to cooperate (Schmälzle et al., 2017).

Another research conducted in Australia focused particularly on the affective (amygdala, striatum, nucleus accumbens (NAcc), hypothalamus, ventrolateral prefrontal cortex (vlPFC), ventral anterior cingulate and the anterior insula), cognitive-regulatory (areas of orbitofrontal, dorsomedial and ventral pre-frontal cortex), and mentalizing (regions focused on the medial pre-frontal cortex (mPFC), temporoparietal junction (TPJ) and superior temporal sulcus (STS)) processes in relation to evolving social behavior in adolescence. They discovered that the grey matter volume of the amygdala, regions close to the STS, and the mPFC (brain structures that are a part of the affective and mentalizing systems) is positively connected with the quality of social connections (Lamblin et al., 2017).

Parts of brain affected by ADHD and CP-

ADHD is one of the most common neuropsychiatric conditions and affects 7.2% of children globally. ADHD, which is characterized by its three primary symptoms of hyperactivity, impulsivity, and inattention, poses difficulties for its sufferers in terms of their academic performance, risk of car accidents, social relationships, and danger of substance usage. These symptoms continue throughout adulthood in 60–80% of children and adolescents with ADHD and are linked to relationship issues, poor employment performance, and a lower socioeconomic level.

In a study conducted in U.S.A., white and gray matter of the brain appeared to have decreased volume and function while looking into the areas of the brain impacted by ADHD, which was assumed to influence attention, planning, cognitive processing, and behavior. Due to its connections to other crucial regions including the caudate nuclei and cerebellum, which together are involved in the regulation of attention and behavior, the prefrontal cortex (PFC) has recently been shown to play a crucial role as well (Mehta et al., 2019).

Other neuroimaging studies support that ADHD is an issue with early brain development. There are variations in the anatomical development and functional activation of the prefrontal cortex, basal ganglia, anterior cingulate cortex, and cerebellum, according to volumetric and functional MRI studies (Bélanger et al., 2018).

Cerebral Palsy (CP), in addition, is the most common severe motor disability in children and covers a group of long-term conditions that affect roughly 2–2.5 children in a 1000 (Björquist et al., 2014). The part of the brain thus affected here is primarily the ‘cerebrum’. Cerebral anomalies, which are frequently unrecognized before CT or MRI, have been found in

imaging investigations of children with cerebral palsy. CP appears to be caused by a variety of various brain developmental flaws, including neuronal migration problems such *schizencephaly* (abnormal slits or clefts in the brain) or *polymicrogyria* (abnormal development of brain before birth) (Korzeniewski et al., 2018).

Difference in love and friendship between typical and atypical children:

While there is a plethora of research exploring love and friendship in typical individuals, it is alarming how little research has been done to comprehend these interactions in people with attention-deficit/hyperactivity disorder (ADHD) and cerebral palsy (CP), despite the frequency of both the disorders and their impact on social functioning. Recent research has shown the intricate interactions between neurological function, social function, and relationship quality in people with these disorders. Therefore, there is a critical need for such a review to understand how atypical individuals navigate and experience love and friendship.

A combination of quantitative as well as qualitative studies were reviewed and one of the studies conducted in the Canada found that adolescents with *attention deficit hyperactivity disorder (ADHD)* had more romantic partners than their typically developing peers, however, did not differ on their age of entry into romantic relationships. Differences were also visible in the duration of romantic relationships, as it was found that females with ADHD often had shorter relationships as compared to girls typically, however there was no such distinction in males. These findings were attributed to their poor social information processing, excessive negative behaviour, and lack of social abilities, which also in turn affected the stability of their friendships (Rokeach & Wiener, 2014). It was also found that adolescents with ADHD reported to have around double the number of sexual partners as compared to their typically developing peers. This hints towards negative behaviours such as unsafe sex practices, substance use, academic underachievement, etc (Crockett et al., 1996). The same study also talked about how there was not a difference found in the measures of relationship quality (Rokeach & Wiener, 2014), however, several studies of the past have stated how individuals with ADHD tend to underreport the presence of problems or even overestimate their competence in social relationships (Hoza, & Kaiser, 2007).

While discussing friendships in children with ADHD, it has been suggested that children with Attention Deficit/Hyperactivity Disorder (ADHD) are likely to display behaviours of physical and relational aggression with peers (Whalen & Henker, 1992; Zalecki & Hinshaw, 2004) and very likely to be socially isolated in typical schools, regardless of their gender (Mikami & Lorenzi, 2011). When compared to the quality of friendships among children who typically develop, friendships among ADHD children have been reported to be less positive and more negative (Normand et al., 2011). In accordance with the study conducted by Rokeach and Weiner (in 2014), it was found that ADHD children happened to have lesser mutual friends and lesser stable and enduring friendships in comparison with their typically developing peers. It was also found that more often than not, children with ADHD were more likely to befriend a peer with a disability, rather than a typically developing peer (Kouvava & Antonopoulou, 2018). These results are consistent with prior research data that indicates that the primary symptoms of ADHD, such as inattention, impulsivity, and hyperactivity, as well as the propensity to be overbearing, insensitive, and emotionally charged could be the reason why such differences exist (Normand et al., 2013).

In a qualitative study conducted in Sweden, aimed at understanding the needs of adolescents with *cerebral palsy (CP)*, it was found that adolescents with CP often struggled with making friends and spending time with people romantically. Their peers often did not want to be with them or would tease or bully them. Adolescents also mentioned that they did not know how

to approach people and take the relationship ahead once they had become friends, for instance inviting people over. They also majorly struggle with having someone to talk to about love and sexuality and thus do not know how to act in intimate situations or on a date. While they perceive romantic love to be an important part of their lives, they reported to having barely any experience in the area of relationships and sexual activities as compared to their peers (Björquist et al., 2014).

Another study, in Netherlands, proved to be in congruence with the findings of the aforementioned research, and found that adolescents with CP find it difficult to develop intimate relationships and have significantly lesser experience with sexual activities as compared to people their age. Compared to typically developing girls, girls with CP had less experience with courtship and romantic relationships, whereas comparatively few boys with CP had a stable girlfriend. Their social functioning is 30% below their typical age level, however the main problem was not maintaining a close friendship but maintaining a stable relationship. Physical limitations proved to rarely be an obstacle in friendship but adolescents with wheelchair-dependency, regarded it as an obstacle with romantic or sexual relationships. These struggles may also be attributed to a lack of self-confidence and low self-esteem, resulting in heightened doubt on self and others (Wiegerink et al., 2006).

In conclusion, establishing and maintaining friendships and romantic relationships can be difficult for adolescents with ADHD and CP, even if they have a positive perspective of them. Although there is limited research on this topic, what is understood indicates that neurological function, social abilities, and relationship quality are interconnected. Additionally, social challenges brought on by ADHD and CP can have a substantial impact on the establishment and maintenance of social bonds. The view is that with appropriate resources and support, people with ADHD and CP can overcome these problems and experience the advantages of positive social connections. The next section discusses interventions to assist these people develop and maintain fulfilling relationships.

Interventions

For children and adolescents with ADHD:

It is imperative for the people who work with children suffering from ADHD, to routinely evaluate the qualities of the children's friendships and carry out treatments that emphasize forming solid dyadic friendships. Even though psychostimulant medication has proved to generate better opportunities for children with ADHD to develop friendships by decreasing their impulsive and aggressive behaviors, the establishment of mutual friendships involves more complicated abilities than simply the absence of aggressive tendencies (Normand et al., 2007). Thus, here are some of the interventions that have proved to be effective in establishing better and more fulfilling friendships and romantic relationships in children and adolescents with ADHD-

As a part of an intervention proposed by Hoza et al., back in 2003, participating children are paired with another child in the program, based off of the child's preferences. Children would then participate in various shared activities, projects, field trips and have a system of sharing points that they've earned for practicing desirable behaviour. Parents are supposed to arrange get-togethers outside of the program environment and supervise from a distance. This intervention has highlighted that better quality of friendships determine positive outcomes such as better social skills, problem-solving, higher self-esteem, and happiness at the end of the program. This also fosters parental involvement and support towards the child (Gardner & Gerdes, 2013).

According to recent study, friendship interventions for children with ADHD that emphasize the growth of positive relationships with one friend have positive outcomes (Hoza, Mrug, Pelham, Greiner, & Gnagy, 2003). Compared to interventions aiming at raising a group's peer status, peer-focused interventions have a higher chance of success and are easier to put into practice.

A proposed intervention to help children and adolescents better their friendships could be based off the fact that adolescents with ADHD often are unable to focus on one task or stimuli, so they may be paired with typically developing adolescents in their classroom and then be asked so to solve a series of problems. When the ADHD child deviates from the problem, their partner could recentre their attention by asking problem related questions in a story-like narrative way and help them get back on track. This fosters friendship, a level of understanding and teamwork between the two adolescents, thereby creating a space for the adolescent with ADHD to feel a sense of camaraderie and then make it easier for them to approach a friendship.

It is essential to discuss the romantic relationships of adolescents with ADHD, since the framework for romantic relationships in adulthood is thought to be established during adolescence. It is well established that intimacy and attachment patterns in romantic relationships in adulthood are influenced by intimacy and attachment patterns that form during this period of development (Meier & Allen, 2009; Rauer et al., 2013). Recent research has found that targeting emotional dysregulation may be an effective strategy for changing the course of the romantic relationships and sex lives of adolescents with ADHD (Margherio et al., 2020) and there has been evidence to show that emotional dysregulation in adolescents and young adults with ADHD may be effectively managed with medication and psychotherapy (Mitchell et al., 2017; Suzer Gamli & Tahiroglu, 2018).

Other effective interventions that target emotional dysregulation among adolescents with ADHD include methods like ‘Anger Management Training (AMT)’, which include guidance on both internal and external sources of anger as well as non-aggressive problem-solving. The effectiveness of AMT with children with ADHD has been investigated by many. AMT is known to enhance therapeutic gains when paired with medicine, behavioral therapies, and self-control training (Miranda and Presentacion 2000). Another effective method has been ‘Mindfulness Meditation (MM)’, which is linked to improvements in a variety of outcomes in a recent evaluation of the effects of MM on the functioning of adolescents with ADHD. In particular, mindfulness practices have been linked to reductions in behavior issues, and peer relationship issues (Haydicky et al., 2015) among young people with ADHD, as well as improvements in attention, and ADHD symptoms (Bunford et al., 2015).

For children and adolescents with Cerebral Palsy (CP):

Cerebral palsy is unarguably one of the most severe motor disabilities to exist, and entails a variety and combination of impairments, which in association with external factors may make it difficult for adolescents to experience life normally (Björquist et al., 2014). The review paper aims to highlight interventions that could help improve the quality and longevity of friendships and romantic relationships, so as to provide a sense of normalcy and relatability to the adolescents suffering from CP.

In qualitative research, a lot of adolescents highlighted how they struggled with having someone to talk to about friendship and relationships and relate to someone. To aid this, adolescents with disabilities could be better prepared for the transition to adult life,

friendships, and relationships with the help of personal, specific knowledge and assistance from, a "navigator." This is in line with suggestions from different researchers such as Kingsnorth and colleagues (2011), that having individualized support as so, will help adolescents feel seen and heard and find a sense of relatability in all walks of their life.

Compared to similarly aged young individuals who are typically developing, young adults with CP have been found to have less experience with romantic relationships and sexual activity. Dating and involvement in peer group activities were strongly correlated with these outcomes, but relatively weakly with CP-related traits or gender. Young adults with CP may thus benefit from participating in peer group activities and providing a conscious or deliberate environment/ opportunity to set up dates in order to develop romantic relationships and advancements in their sexual life (Wiegerink et al., 2006).

CONCLUSION

In conclusion, improving the quality of life for adolescents with ADHD and Cerebral Palsy requires an understanding of how they perceive friendship and love. We have been able to create effective interventions to support them in establishing meaningful connections with others by investigating their unique experiences, obstacles, and capabilities. Even though there is still plenty to learn in this area, the research reviewed here offers encouraging insights on how we could assist these adolescents to develop meaningful interpersonal relationships. To reiterate, it is our responsibility, as a society, to create an environment where all adolescents, regardless of their neurodevelopmental differences, can experience the joys and benefits of love and friendships.

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Conflict of Interest
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