A Neuropsychological Perspective on Creativity, Active Self-Expression, and Identity Formation

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Abstract: This study reviews the connections between art, psychology, and neuroscience by examining the effect of active self-expression on identity formation and neural processes. Active self-expression activates three specific networks in the brain: the default mode network (DMN), the executive control network (ECN), and the salience network (SN), associated with introspection, evaluation, and emotion, respectively. These three systems demonstrate how creative activity leads to strengthening self-concept and identity through emotional regulation and self-referential thinking. Through art engagement, individuals can experience psychological benefits such as emotional regulation and identity clarity by activating reward and introspection systems in the brain. Additionally, active self-expression creates a sense of strong community and social connectedness when compared to passive expression or observation. Although studies are limited by sample size, diversity, and differences in methodology, consistent evidence reveals that creativity and identity have neural overlap and correlation. Future directions include the implementation of art in community projects, school curriculum, and as a therapeutic tool. Overall, active self-expression acts as both a recreational activity that improves emotional regulation and social connection through community and culture, and a neurological process outlined by brain networks, reward systems, and mental health benefits.

Introduction

Creating art is not only a reflection of emotion but also a neurobiological process that reshapes how we experience and define ourselves (Bolwerk et al., 2014). Self-expression through art functions as a hobby; it also yields several psychological benefits and biological effects. This paper will review the relationship between active self-expression and identity formation through the lens of brain networks. Identity formation is the process of creating your sense of self: finding out your values, roles, and personality. Studying identity formation in adolescence is particularly important because the key decisions made during this period significantly shape one's identity into adulthood. During active self-expression --art, music, movement, and writing-- neural systems respond and engage self-referential processing and identity formation. The connection between neural processes and artistic expression can inform the design of mental health interventions and art therapy approaches.

Active self-expression consists of two components: art engagement and self-expression. (Barnett & Vasiu, 2024; Bokoch et al., 2025; Jamaal, 2019). Art itself encompasses several methodologies, including drawing, painting, sculpting, writing, film, dance, drama, music, neuroaesthetics, photography, poetry, visual art, and design (Bokoch et al., 2025; Jamaal, 2019). Additionally, there are two modes of art engagement: active and passive, where active includes making art and passive includes looking at already created art (Barnett & Vasiu, 2024). Together, these definitions of art and art-expression result in creative self-expression (Jamaal, 2019). Creative self-expression can be defined as the natural and inherent urge to express the self through art or in a creative way, through the methodologies of art described previously (Jamaal, 2019). Active self-expression, compared to passive observation, more strongly engages brain systems associated with agency and self-referential processing (Bolwerk et al., 2014). Additionally, active engagement is not only neurologically significant but also an

important factor in personal growth and well-being (Barnett & Vasiu, 2024; Bokoch et al., 2025; Jamaal, 2019). By creating art instead of just observing or passively interacting with it, active engagement allows for a period of catharsis and expression for emotion and ideas (Barnett & Vasiu, 2024; Bokoch et al., 2025; Jamaal, 2019). Self-expression permits the sharing of personal experiences, thoughts, and feelings (Barnett & Vasiu, 2024; Bokoch et al., 2025; Jamaal, 2019). By expressing sense of self through an outlet, people then understand themselves and build self-awareness, thereby strengthening their identity (Barnett & Vasiu, 2024; Bokoch et al., 2025; Jamaal, 2019).

Identity formation is a developmental process in adolescence and dynamic across adulthood (Crone et al., 2022; Whitbourne, 2002; Kroger, 2002). Identity formation is significant both psychologically and socially (Crone et al., 2022; Whitbourne, 2002; Kroger, 2002). It shapes how adolescents understand themselves, make decisions, build peer relationships, and strengthen traits like resilience and emotional stability (Crone et al., 2022; Whitbourne, 2002; Kroger, 2002). Identity formation helps adolescents build their sense of self as they transition into adulthood (Crone et al., 2022; Whitbourne, 2002; Kroger, 2002). Several theorists conceptualize identity as a biopsychosocial construct integrating self-definition, social roles, and internal continuity (Whitbourne, 2002; Kroger, 2002). During adolescence, an individual's self-concept and identity are particularly salient (Crone et al., 2022). Specifically, clarity, or stable and consistent beliefs, and appraisal, or outside-estimated beliefs based on subjective descriptions, of self-concept are crucial to note (Crone et al., 2022). Identity is intertwined with these, as it is defined to be one’s continual and consistent sense of who one really is (Crone et al., 2022). Clarity of self-concept must be present, as one cannot know who they are consistently if they do not have stable beliefs (Crone et al., 2022). For example, an adolescent who has clarity will understand they have a certain trait, like creativity, and consider themselves creative (Crone et al., 2022). If this same adolescent has an appraisal of self-concept, then their peers might tell them how creative they are as well (Crone et al., 2022). This is essential to differentiate, as identity has several dimensions (Crone et al., 2022; Whitbourne, 2002; Kroger, 2002). It encompasses several facets such as social roles, gender, culture, and work-related aspects (Crone et al., 2022; Whitbourne, 2002; Kroger, 2002). Later, in adulthood, theorists conceptualize identity as a biopsychosocial self-definition focusing on physical, cognitive, relational, and social roles (Whitbourne et al., 2002). Identity development involves balancing assimilation, aligning with existing beliefs, and accommodation, updating beliefs based on new experiences (Newman et al., 2012).

Three brain networks are relevant to self-expression and identity: the default mode network for self-referential thought and introspection, the executive control network for evaluation, and the salience network, which switches between the two (Sawyer, 2011; Bolwerk et al., 2014; Dietrich, 2004; Bokoch et al., 2025; Crone et al., 2022; Barnett & Vasiu, 2024) (Figure 1; Nekovarova et al., 2014). The brain uses all three of these networks to engage in identity formation and creative processes. (Sawyer, 2011; Bolwerk et al., 2014; Dietrich, 2004; Bokoch et al., 2025; Crone et al., 2022; Barnett & Vasiu, 2024).

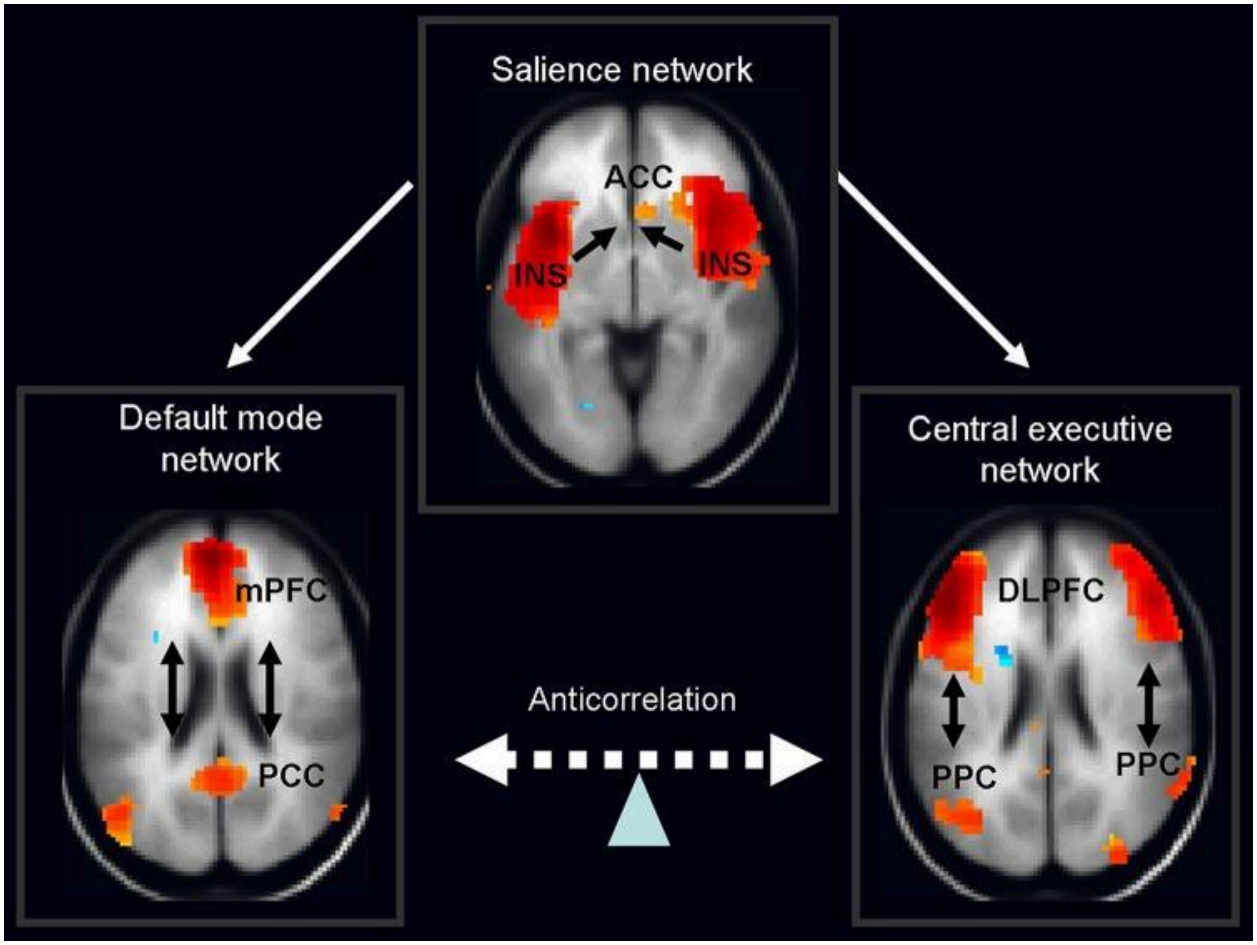

Figure 1
Schematic figure of the triple network model consisting of the default mode network (DMN), salience network (SN) and central executive network (CEN).

The default mode network is several brain regions that work in conjunction to trigger self-reflection, introspection, and emotional regulation. The brain regions involved are the posterior cingulate cortex (PCC), medial prefrontal cortex (mPFC), temporal regions (MTG/STG), and parietal regions (Sawyer, 2011; Bolwerk et al., 2014; Dietrich, 2004; Bokoch et al., 2025; Crone et al., 2022; Barnett & Vasiu, 2024). Each part specializes in a function, but when they interact together, the default mode network activates autobiographical memory, self-referential thought, spontaneous idea generation, and mind-wandering (Sawyer, 2011). Mind wandering can result in creative insights. For instance, temporal regions are triggered by musical improv (Sawyer, 2011). Specifically, the posterior cingulate cortex is associated with self-reflection; the mPFC is associated with emotional regulation, stress resistance, and introspection; the temporal areas are associated with memory; and the parietal regions are associated with sensory feelings. (Sawyer, 2011). On a neural level, neurotransmitters, linked to reward and motivation, are triggered by the process of creativity (Barnett & Vasiu, 2024). The mPFC is particularly important for self-referential and creative thinking (Crone et al., 2022). This suggests that creative thinking engages the same regions involved in identity processing

(Sawyer, 2011; Bolwerk et al., 2014; Dietrich, 2004; Bokoch et al., 2025; Crone et al., 2022; Barnett & Vasiu, 2024).

The executive control network includes the dorsolateral side of the prefrontal cortex (DLPFC), frontoparietal control regions, and the temporal junction (TPJ). These parts focus on focused creativity, planning, working memory, social information processing, and evaluation (Crone et al., 2022; Sawyer, 2011). Increasing activity in the executive control network, specifically during adolescence, results in identity clarity and future-oriented concepts (Crone et al., 2022). The executive control network uses the DLPFC and TPJ to refine and plan creative output, allowing one to evaluate and adapt their ideas.

The salience network combines the two networks to work together (Sawyer, 2011; Barnett & Vasiu, 2024). It includes specific parts of its own, such as integration hubs like the ACC and ventral mPFC (VMPFC), as well as limbic structures like the amygdala (Sawyer, 2011; Barnett & Vasiu, 2024). It focuses on integrating emotion with cognition, cognitive flexibility, stories, emotion, and self-reference (Sawyer, 2011; Barnett & Vasiu, 2024).

Foundations

Neurological Side of Self-Expression: How Self-Expression Works in the Brain

Self-expression activates both reward systems and self-referential brain systems that suggest pleasurable and identity-reinforcing outcomes (Barnett & Vasiu, 2024; Kaimal et al., 2017; Tamir & Mitchell, 2012). Research shows how reward systems and self-referential systems are activated when people express themselves (Barnett & Vasiu, 2024; Kaimal et al., 2017; Tamir & Mitchell, 2012). When talking about oneself to others, both the mPFC and reward systems (NACC and VTA) are activated (Tamir & Mitchell, 2012). When creating art, these same systems are also activated. In an fNIRS drawing study, visual self-expression was tested through coloring, doodling, and drawing (Kaimal et al., 2017). Thereby, the same area, mPFC, is engaged, and this may suggest that doing art is intrinsically rewarding as well (Kaimal et al., 2017).

Introspection and expression are both biologically fulfilling behaviors and psychologically fulfilling behaviors (Kaimal et al., 2017). Doodling, which both allows for expression and contains structure or a prompt, possibly reveals perfect, or optimal, self-expression conditions where one has both agency to do what they want and a lack of inhibition to control them (Kaimal et al., 2017). In a majority of studies, the mPFC is considered to be a crucial part of introspection, self-referential thought, and self-expression (Barnett & Vasiu, 2024; Kaimal et al., 2017; Tamir & Mitchell, 2012). For example, mPFC is activated when people evaluate their own thoughts, when they feel creative, or when they feel emotion (Kaimal et al., 2017). Therefore, when you create or reflect, you rely heavily on your mPFC, and that the same network that builds your sense of identity (Barnett & Vasiu, 2024; Kaimal et al., 2017; Tamir & Mitchell, 2012). Actively participating in art creation can build how one thinks of themself and resilience, which contribute to identity continuity (Barnett & Vasiu, 2024; Kaimal et al., 2017; Tamir & Mitchell, 2012).

Neurological Side of Creativity: How Creativity Works in the Brain

The neurological side of creativity engages several regions, including the default mode network, the executive control network, and the salience network (Sawyer, 2011; Bolwerk et al., 2014; Dietrich, 2004; Bokoch et al., 2025; Crone et al., 2022; Barnett & Vasiu, 2024). This transition between the three allows for different kinds of ideas: insights (aha!) and focused

refinement of ideas (Sawyer, 2011). However, the use of these networks is not a single effort by each individual part, but instead a combined use through coordination, as the brain does not function only in sections (Sawyer, 2011; Barnett & Vasiu, 2011). Part of the DMN, or the prefrontal cortex, creativity uses both the ventral and dorsolateral prefrontal areas (Sawyer, 2011; Dietrich, 2004). The DMN allows for autobiographical reflection and personal meaning, which is directly related to identity and self-expression, and thereby internally motivated creativity (Sawyer, 2011; Dietrich, 2004). Creative insights and self-reflection both use the mPFC and PCC, which again shows that creativity is a form of self-expression, at least neurally (Sawyer, 2011; Dietrich, 2004). As previously mentioned, the VMPFC and mPFC are used in self-expression and identity. The executive control network allows for the cognitive flexibility of ideas, where once the ideas form in the DMN, they are processed through the ECN to fit the constraints of the problem (Crone et al., 2022; Sawyer, 2011). This allows for a creative result (Crone et al., 2022; Sawyer, 2011). The salience network allows the connection between these two and switches back and forth (Sawyer, 2011; Barnett & Vasiu, 2011). During a deep creative state, SN activity increases and reflects emotion and self-relevance (Sawyer, 2011; Barnett & Vasiu, 2011). Damage to the frontal cortex and these areas can impair creativity and social functioning, showing its role in both art-making and self-referential thought (Dietrich, 2004). Additionally, neuroimaging evidence suggests that creative ideation increases activity between the DMN and ECN (Beaty et al., 2015). During divergent thinking, fMRI showed synchronized activity between the PCC, a part of the DMN, and the dorsolateral prefrontal cortex, a part of the ECN, showing a correlation between self-generated thought and evaluation (Beaty et al., 2015). This suggests that creativity arises from dynamic interactions between these two brain systems (Beaty et al., 2015).

Arts/Active Self-Expression and Identity: How Identity and Active Self-expression are Related

Expression is a means of identity (Bokoch et al., 2025; Malik, 2022; Newman et al., 2012). For example, a study involving adult participants had subjects engage with art through creation or participation, revealing that visual art promotes identity maintenance, identity revision, and resistance (Newman et al., 2012). Identity maintenance is the continuation of identity through art (Newman et al., 2012). Identity revision is the exploration of identity with something new, where art is a way to redefine oneself (Newman et al., 2012). The study Resistance revealed that when adults resisted art or excluded themselves, they became defensive about the art, expressing frustration or anger (Newman et al., 2012). For example, some participants became frustrated because they did not see the point or understand the artwork and focused more on the creation and external appearance of art rather than meaning or provocation (Newman et al., 2012). If identity maintenance is continued, then identity goes through a balance of assimilation and accommodation (Newman et al., 2012). Understanding the art with one's identity resulted in emotional stability, purpose, connectivity, and overall well-being (Newman et al., 2012). Therefore, art functions as a bridge between neural processes and the evolving sense of identity (Bokoch et al., 2025; Malik, 2022; Newman et al., 2012).

Additionally, in a multi-faceted approach, self-expression through art is influenced by cultural identity as well (Yang et al. 2019; Shao et al., 2019). Research suggests that when one passively engages in art from their own culture, their brain shows more activity (Yang et al. 2019). For example, in a previous study based on Western and Chinese art and using fMRI to

measure activity, the engagement of the DMN's self-referential processing was shown when viewing aesthetic pleasure from art (Yang et al. 2019). However, each cultural group rated its own ethnicity's art higher in specific categories, showing greater engagement. (Yang et al. 2019). Additionally, a second study showed how Western countries tend to view art for its originality, expression, and product-creation creativity, while Eastern countries view art for harmony and rediscovery of tradition (Shao et al., 2019). This suggests that Western perspectives associate creativity with innovation and novelty, while Eastern perspectives focus on wisdom and rediscovery of tradition (Shao et al., 2019). This study also suggests that being exposed to multiple cultures, like from living abroad or having multicultural experiences, results in cognitive flexibility and increased synthesis of ideas and, therefore, increased creativity (Shao et al., 2019). Overall, cultural contexts enhance creative thinking, influencing identity and adding to self-referential neural activity (Yang et al. 2019; Shao et al., 2019).

Identity formation focuses on neurocognitive development in self-referential thought, emotion, and cognition. For example, research suggests that adolescence is a crucial stage for heightened mPFC self-processing (Pfeifer & Peake, 2012). Its dorsal region focuses on cognitive self-evaluation, and its ventral region focuses on emotional self-relevance and feedback (Pfeifer & Peake, 2012). When the mPFC is activated, people engage in autobiographical memory where they evaluate personal traits or their own life (Crone et al., 2022). Additionally, when social experiences like judgment, embarrassment, or acceptance are experienced, the mPFC is activated (Crone et al., 2022). When people go through self-concept training or enrichment programs to create positive traits, it also furthers mPFC activity (Crone et al., 2022).

A strong sense of identity supports emotional being and resilience. Identity theory encompasses several ideas, but ultimately, theorists conclude that it is a process based on social roles, personal values, and group dynamics (Cinoğlu & Arikan, 2012). Individuals internalize roles that are meaningful to them or enforced by others' external approval and try to find a sense of self that matches both how they see themselves and how others perceive them (Cinoğlu & Arikan, 2012). When outside stressors affect this identity, people are prone to change or adapt their identity to their situation, adopting or abandoning old or new identities (Cinoğlu & Arikan, 2012). Identity is also heavily influenced by social belonging and group roles, as individuals may compare themselves to others or need to take on a leadership role (Cinoğlu & Arikan, 2012). Theorists also debate over one identity presiding over other identities in oneself, or all identities are used together to understand the self in several contexts (Cinoğlu & Arikan, 2012).

Significance, Limitations, Future Directions

Overall, this review exemplifies the intersection between art, psychology, and neuroscience, connecting how creative expression is influenced by neural networks and identity. Through examining studies on art engagement and therapy, the psychological benefits of emotional regulation, well-being, and socialization are emphasized. Additionally, the neurological aspects underlying these benefits provide a biological background to artistic engagement and relate them to reward and emotion. This review aims to contribute to a growing field of research that bridges artistic expression or engagement with scientific aspects in order to suggest or offer possible applications in mental health, adolescent development, and further knowledge. For example, art is utilized in community projects, art programs in schools, or as a therapeutic method. Further policy or educational directions, as funding for art is often low, could

include integration into the curriculum in order to benefit and strengthen community mental health. More projects involving art expression could encourage creativity and stronger community connections between both adolescents and adults.

However, there are several limitations across the reviewed studies. Many articles focused on small sample sizes or certain regions only. For example, there were two studies based only in the United Kingdom. Others had specific age ranges like adolescence or older adults, again limiting the sample size. Secondly, there were several methodologies used, which made cross-comparison slightly difficult, as some studies used one method over another, or some studies would use several methods. These varying differences suggest that these are insights that could be studied in more detail in the future.

Future directions may focus on more longitudinal designs that study the effects of art engagement over time and through developmental stages, rather than just one specific stage, like adulthood or adolescence. A more culturally diverse sample could clarify potential differences in art engagement and identity across populations. Using culturally diverse samples and a variety of neuroimaging methods could provide a more complete understanding of how active self-expression influences neural processes.

Conclusion

While the importance of art is often overlooked or undervalued, it plays a meaningful role in mental health, expression, identity, and brain activity. The neural connection between creativity, self-expression, and identity formation lies in the three fundamental networks that relate to self-referential thought, introspection, and evaluation: the Default Mode Network, the Executive Control Network, and the Salience Network, and reveals how art is intertwined with the brain and sense of self. Through this overlap, art becomes a transformative process: both a relaxing activity and a neurological avenue for developing identity. Adolescence is a developmentally important time for these processes, as the medial prefrontal cortex and related self-referential systems develop and create one's identity. When participating in active self-expression, adolescents improve their identity clarity, emotional regulation, and resilience, creating strong traits that bring stability in adulthood. Overall, these findings have significant implications for art therapy and self-understanding, revealing that when implemented in educational or therapeutic environments, they help support the development of identity and resilient traits. Ultimately, understanding the art brain self-connection leads to a deeper understanding of not only expression but also identity formation.

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Figures

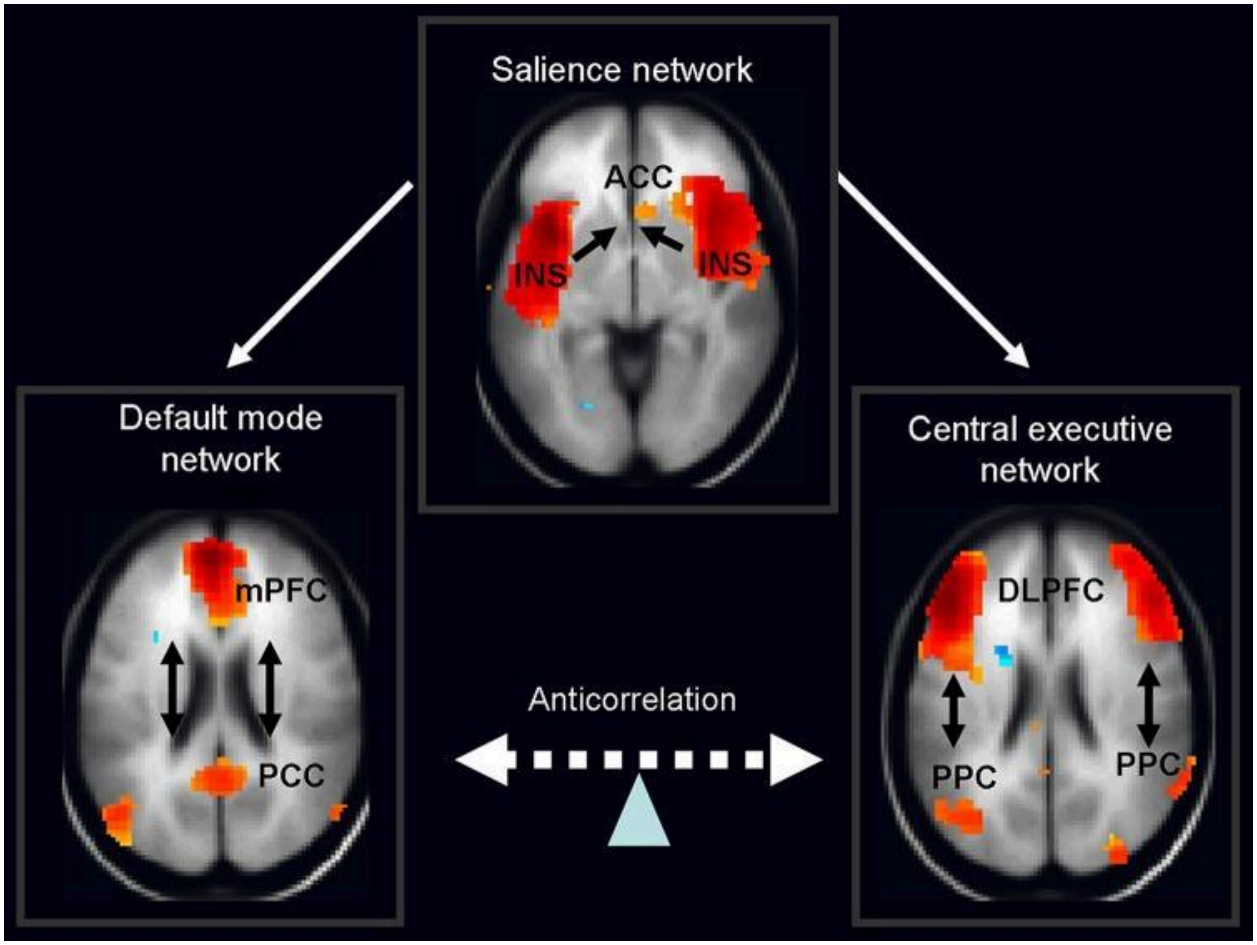

Figure 1
Schematic figure of the triple network model consisting of the default mode network (DMN), salience network (SN) and central executive network (CEN).
Note. Reprinted from "Bridging disparate symptoms of schizophrenia: a triple network dysfunction theory," Nekovarova, T., Fajnerova, I., Horacek, J., & Spaniel, F. (2014), *Frontiers in behavioral neuroscience*, 8, 171.