# The Creative Mind

## *Exploring individual differences in creativity*

Sarah Rees

### *Introduction*

Creator of the famed Levi's laundrette and Audi's 'Vorsprung durch Technik', advertising legend Sir John Hegerty, speaking on creativity, stated recently: "Everyone can do it - just some of us are better at it than others" (Public Interview, Hay Festival, 2014).

If, as Hegerty claims, all human beings possess creative potential, why is it that some are able to change the world with their extraordinary and fantastic ideas, whilst others remain uninspired or locked into narrow, constricted ways of thinking?

I explore in this essay some of the reasons why individuals might differ in their creativity, looking towards possible evidence from the fields of socio-cultural psychology, genetics and neurobiology.

### *To Define Creativity...*

Creativity is intriguingly positioned between science, psychology and the arts and there has been much scholarly discussion around how to define it. Robinson (2001:118) talks of "imaginative processes with outcomes that are original and of value" whilst Jung et al (2001:398) suggest that: "Creativity refers to the production of something both novel and useful within a given

social context". Hegerty (2014) speaks of creative ability in terms of "disrupting" set ways of thinking; whether through a provocative piece of art, a powerful television advert or a beautifully crafted sentence - creativity is about original ideas that make changes in the world. Csikszentmihali (1996:9) alludes to the same concept, though is critical of the term "covering too much common ground" (*ibid*: 25) and being forever shrouded in confusion. He talks of creativity in two forms; 'Little c': routine, everyday imaginative acts... and 'Big C': the "process by which a symbolic domain in the culture is changed" *(ibid, 8*), referencing here the likes of Einstein, Edison, Picasso, DaVinci who all have, undoubtedly, left behind them a changed world.

Regarding possible contributory factors to individual differences in creativity though, it appears there are both environmental and biological influences on creative development. In this essay, I consider just two possible environmental factors before briefly touching on the genetics and neurobiology behind creative thought.

I first contemplate what Vygotsky (2004{1930}:11) described as: "*The most authentic, truest creativity*"; children's imaginative play. Fantasy play and day dreaming appear to provide a unique opportunity for children to ignite their creative potential and I propose that a lack of these experiences in childhood could account for some individual differences in adult creativity.

***To play and to dream...***

*'The Volcano Man'*

*"Got to get all this lava here…ouch, gee! ARGHHHHH..!!"*

*The tiny boy was struggling up the muddy bank, with an adult's head torch, its light turned to red, crammed down over his ears and mop of blonde hair. His climb was made more difficult by the fact that he was carrying an old 'spot light fitting' in one hand, a heavy iron hook and enormous rubber bucket in the other.*

*He sharply drew in breath as the 'volcano' obviously 'erupted' for a second time before his very eyes.*

*"QUICK!!" he shouted to what I presume were a long line of trusty colleagues following his lead up the 'mountain', "We've got to get all this lava!"*

*He briefly disengaged from role to inform me about the nature of his 'task'. "I'm a*

*Volcano Man Mummy, I go to Volcanoes and collect lava and stuff."*

*"Wow…" I am genuinely awestruck at the thought of such a man.*

Rees-Elford (2008)

Imaginative play naturally assumes a central position in discussions on creativity and childhood (Vandeburg, 1980; Sutton-Smith, 1997; Jenkinson; 2001). Indeed, there is much literature to substantiate the view that

experience of childhood play supports development of the creative processes necessary not only for later artistic work, but also to successful accomplishments in literacy and numeracy (Dansky and Silverman, 1973; Berretta and Privette, 1990; Howard-Jones, Taylor and Sutton, 2002; Holmes and Geiger, 2002; Wood and Attfield, 2005) and general problem solving (Sylva, Bruner and Genova, 1976).

***Play opens a 'Creative Space' in the Mind...***

Rugg (1963) suggests that the imaginary 'space' is an intermediary between the unconscious and the conscious mind. Christoff (2009;4) describes creative thought to be sitting in the middle of a "thought continuum", between goal directed and spontaneous thought and claims that it shares neural and cognitive commonalities with both. Perhaps through regularly 'entering' this imaginary space in childhood, the ability to naturally employ creative thought is born.

It is possible to observe children in deeply imaginative play lose self consciousness as they become wholly immersed in their fantasy. It is almost as if they enter a contented state of "flow" as highly skilled adults as surgeons, scientists, sportsmen and artists do, when working at their absolute optimum (Csikszentmihali, 1990). Lahad's (2000; 16) concept of 'Fantastic Reality' is a similar state; a creative mental 'space' in which "time and space are suspended and where the impossible is made possible". Christoff (2009:8) and others (Gabora, 2002, Heilman, Nadeau and Beversdorf, 2003; Howard-Jones and Murray, 2003) show that such states of defocused attention and lowered cognitive control may be fundamental to enabling creative thought.

The link between "wider, looser attentional focus" (Christoff, 2009; 10) and creativity is evidenced by neuroscientific research on several different accounts:

Divergent thinking tasks have been seen to cause decreased beta range synchrony and increased alpha range synchrony in the frontal cortex (Fink and Neubauer, 2006; Molle et al, 1996), indicating lower prefrontal cortical arousal and reduced cognitive control. Further to this, lower levels of the two catecholamines, noradrenaline and dopamine, have been found to increase creative thinking ability (Heilman, Nadeau and Beversdorf, 2003; Beversdorf et al, 1999; Kischka et al, 1996). Research has also shown that waking out of REM sleep is associated with an increased ability to solve anagrams (Walker et al, 2002). During REM sleep noradrenaline levels decrease (Rasmussen, Morilak and Jacobs, 1986) and naturally reduced cognitive function and heightened 'hyper-associative imagery' occur concurrently (Fosse, Stickgold and Hobson, 2004).

There is perhaps a lack of pedagogical support for play and daydreaming during childhood. Research evidence shows that early formal learning may not be beneficial to fully developing children's potential and certainly may be unfavorable to the development of creativity (Waite and Davis, 2006; Jeffrey and Wood, 2008), however the UK's mainstream educational focus for early childhood still emphasizes the early development and maturation of rational, focused thinking; even at age four to five, children are required to "write simple sentences, sometimes using punctuation" (DCSF, 2008; 59). Alternative education systems such as the Steiner Waldorf movement, place

much more emphasis on developing creative thinking and look to provide learning environments where creativity, mind wandering and a state of 'flow' can easily occur (Waite and Rees, 2011; 56). 'Possibility thinking' (Craft, 2002) is encouraged by giving young children unformed toys, undirected time in nature; and "time and space to dream" (Waite and Rees, 2011; 58/59). As the Steiner curriculum progresses, teachers guide children to learn creatively and experientially, through story-telling, art, movement and music rather than via purely didactic means. Findings from Ogletree's (1996) international study that measured differences in creative thinking ability of Steiner and state school pupils, showed significantly higher levels of creativity in the Steiner cohort. Ogletree (2000: 1) suggests this finding was almost certainly due to the whole "maturational-readiness and nurturing curriculum system". The Torrance Test of Creative Thinking Ability used in this study employed divergent thinking (DT) tasks, a test widely used to measure creativity under environmental conditions. Jung et al (2009; 5324) expose the "ongoing weakness" of using DT tests in creativity studies, claiming that there are numerous other features beyond DT to creativity, including convergent thinking and insight. However, other studies using different methodologies appear to substantiate Ogletree's findings (Hutchingson and Hutchingson, 1993; Cox and Rolands, 2000; Jelinck and Sun, 2003).

Another possible environmental cause for people differing in their creative ability is linked with sibling order within a family. Findings are inconsistent however, with some studies suggesting that firstborns are less creative than

their laterborn siblings (Eisenman, 1964; Staffieri, 1970; Seay, 1985), others that they are more so (Eisenman, 1987; Eisenman and Schussel, 1970; Schubert, Wagner and Schubert, 1977) and some have found no differences whatsoever (Albaum, 1977; Cicirelli, 1967; Datta, 1968; Wilks and Thomson, 1979). There is evidence to suggest that creativity in first born children is decreased if there are large age differences within the sibling group (Baer et al, 2005). Perhaps because, in this instance, less imaginative play occurs between much older and younger siblings and relationships take on more of a caregiver/child role. Baer and his colleagues also found that creativity increases with greater sex differences within the family group and that overtly masculine or feminine behaviour in play is associated with decreased creativity. Maybe mixed sex siblings are encouraged to broaden their attentional focus towards different play themes, drawing ideas from the opposite sex sibling, whereas in a family of all boys or all girls, each group tends to focus on either more masculine or more feminine play. The increased creativity with sex differences only applied however when group size was taken into account, no differences were found in small family groups.

Such intricate complexities of family structure and play opportunities clearly already bring powerful evidence for both environmental and biological influences on creativity. I now consider more deeply some of the biological factors involved.

### *Creativity and intelligence*

Creativity may differ in individuals according to their intelligence level. Whether creativity is directly linked with intelligence or is a separate capacity is arguable, with views in the literature divided. However, according to Haier and Jung (2008) it appears there may be a correlation between creativity and intelligence up to an IQ of approximately 120. Above this, creativity and intelligence show variance independently of one another. Studies on twins and adoptees have shown there is a high heritability for intelligence (Bouchard et al, 1990). Plomin et al (2001) who searched for the genes that might be responsible, found that many different genes code for intelligence (Plomin, 1994). Research for a possible genetic basis to creativity however, is sparse, partly due to the reliability and validity of associated methodology and partly due to a non-consensus on definitions for creativity, with some researchers focusing on it as a 'product' and others on a 'process' (Brown, 1989). Nevertheless, I will now examine some of the few studies that are available.

### *Biological Factors*

Reuter et al (2006) tried to ascertain whether intelligence and creativity share the same genetic basis and identified two associated genes; the dopamine D2 receptor, DRD2, estimated to be linked with verbal creativity and the seretonergic gene TPH1, associated with numeric creative ability. Manzano et al (2010) found similarities in the dopamine organisation in highly creative people and schizophrenics. A lower density of dopamine D2 receptors were present in the thalamus of 'high creatives' than there were in 'low creatives'. This finding might explain why highly creative people can find more unusual

connections in problem solving tasks and also why schizophrenics make strange, sometimes irrational associations (Ullen, 2010).

Howard- Jones (2002) suggests that a creative act of the mind comprises two separate phases; the generative first stage followed by a second analytical stage. Runco et al (2011) examined five candidate genes and their possible relationship to creativity, finding associations between the Dopamine Transporter (DAT), Catechol-O-Methyltransferase (COMT), Dopamine Receptor D4 (DRD4), D2 Dopamine Receptor (DRD2) and Tryptophane Hydroxylase (TPH1) and the generative stage of creativity but not the analytical.

Jung et al (2009) found an association between divergent thinking and neurometabolite levels. Building on previous MRI studies showing that the neurometabolyte N-acetyl-aspartate (NAA) is associated with higher cognition, Jung found that in lower IQ participants, increased creativity was correlated with decreasing levels of NAA in the right hemisphere. In high IQ participants, increased creativity was linked with increased NAA in the left hemisphere. Jung (2009; 5332) states that his study is the first to show that "different biochemical organisation supports creative potential in lower versus higher intelligence cohorts". It would be valuable and interesting to additionally consider the possible causes of increased NAA levels in participants, such as their aerobic fitness level (Gonzales et al, 2013; Erickson et al, 2012). Higher NAA levels in the high IQ participants, could, theoretically, be related to these individuals simply being fitter than their

lower IQ colleagues.  If the lower IQ cohort increased their fitness, would their NAA levels and consequently their creative ability also increase?

***Conclusion...***

It becomes clear that creativity is a multifaceted and flexible phenomenon that appears to grow from highly complex interactions between an individual's environment and his genetics.

The value of allowing our minds to wander, whether we are young or old, is perhaps underestimated in this busy, digital world of media and celebrity where it is not uncommon to be walking along a street and see nothing but the screen of our mobile phone….Hegerty's passionate urge to: "Let go of your earphones, go out for a walk and take time to *observe* what is around you" seems therefore well placed; even if our individual creative potential is restricted by genetic make-up, family structure or lack of childhood play, by making this one simple action, perhaps we can all be inspired to find something original and valuable to bring to the world before we leave.

*Sarah Rees, 2014*

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