

Morris, Jane (2018) Creativity - the biology of learning - the happy wanderer [blog post]. Creativity in the world of primary education [online blog] . (Unpublished)

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## **Creativity – The Biology of Learning – The Happy Wanderer**

<https://wp.me/p92pWp-3D>

Some have asked me how I can justify going for a walk as a researched based activity. After all, aren't academics meant to live in ivory towers lined with books?

My answer is that, alongside the benefits of the exercise that I have discussed in previous blogs, I go out to reflect and think through the things I have read in my own ivory cloud. I'm part of the rest of humanity who spend just under half their waking hours in the act of daydreaming (1). It has seemed common sense to me to walk, a relatively easy and enjoyable task for me, and allow my thoughts to run free.

Am I wasting my time though?

### **Why do we daydream so much and is it important?**

I referred in my previous blog about the way we have survived as a species by evolving the ability to analyse our environment, the threats and opportunities in it and then predicting and navigating a route through. Even now, 21st century man daydreams his way into choosing the best way forward, preparing for upcoming events, and achieving a goal (1).

Day dreaming, or mind-wandering, where we allow relevant thoughts time to flow, is a place where the brain draws on memories as well as dreams of future worlds and is linked to a style of long-term decision making characterized by patience rather than impulsivity (1). It is also a place where we make sense of life and our place in it (5), which is maybe why daydreaming tends to increase if a lot of change is occurring (4).

A day dream can be self-generated, especially if we're doing an easy task, or spontaneous, springing from the subconscious (3). There are different types of daydreams, where we move into the world of fantasy, future or past existences and also consider our own autobiography (4). The brain manages to hijack our focussed thoughts for just under 1 minute in every 2. That's a lot! Writing this has taken twice as long as it could have done simply because my brain kept checking out of what is a complex and focussed task.

Or has it?

### **The neuroscience bit**

There is one network in the brain that has been associated with mind wandering, or day dreaming. Creatively named the default network (DN), it includes, if you're really interested, the medial prefrontal cortex, posterior cingulate cortex, regions of the angular gyrus, and anterior as well as medial aspects of the temporal lobe (3).

Its role is to "contribute to introspective processes that are, in some cases, independent from sensory input. Specifically, the DN is involved in mentalizing, autobiographical memory, spontaneous cognition, self-referential processing, and high-level aspects of emotion" (7)

Originally, it was thought that the DN would deactivate during demanding tasks when the equally dynamically named fronto-parietal control network (FPCN) took over (3).

“FPCN<sub>A</sub> regions are activated when attention is directed toward one’s own thoughts and away from perceptual inputs, for example, during tasks that require metacognitive awareness relational reasoning, multitasking and complex task sets, stimulus-independent and abstract thinking, mentalizing, episodic memory, future planning and prospective memory.”(7)

However, it transpires that these two networks are linked; the DN, rather than going onto standby during a complex task, is likely to increase connectivity between the FPCN regions (3). The DN is influential in bringing conceptual–associative knowledge to bear on current thought and perception and is itself activated by particular functions of the FPCN<sub>A</sub>. (7)

### **Erm, what’s that in plain text?**

I find this rather exciting. If I have understood it correctly, my brain is using my daydreams/mind wanderings/reflections as part of how I address a complex task.

Researching and creating a blog, as a complex task involves all of this as it allows the different daydreaming and cognitive control areas of the brain to work together (3,6). I draw together the salient features of scientific papers and recreating them into something new; my own piece of writing. It takes time as I translate and craft the findings I have read, not only into my own words but also into my long-term memory (1,3). A win-win there then?

### **Not quite**

There are times though when daydreams appear unbidden and seemingly unrelated to the task. These spontaneous ones, most probably activated by the Stone Age hippocampus, are prompted when the troublemaking retrosplenial cortex gets involved (3). The hippocampus is the gatekeeper of long term memories of images, patterns, faces, sounds and location (8, p81) and I do wonder if the tasks we do, or even the location, time, weather, music in the background, whatever, unlock these rogue thoughts.

It is easy to get cross with these interruptions, especially when I’m writing. Daydreams, whether self-generated or spontaneous, that are unrelated to this task at hand, are disruptive to me getting the blog published and they get in the way of the mental pictures I am trying to describe to you on the basis of what I have read to date. They also reduce my awareness of the outside world, which is most probably why I suddenly find myself very hungry when I realised that I have missed a meal. Being deep in thought and perceived to be ‘out of touch with the real world and away with the fairies’ can also leave others thinking that my intelligence is, shall we say, somewhat limited (1). The jury is still out on this latter notion...

### **This is where a walk comes in.**

In the less demanding situation of going for a stroll my daydreams adjust. Despite all the change in my learning that is going on as I attempt to absorb neuroscience facts, there is greater freedom to consider the ‘what if’s’, a means to focus on and solve my current

concern of what it all means for me as a learner and a greater opportunity to think creatively (6) as to how to share these findings. (I have usually partially constructed the blog in my head by the time I am back at base.) Add to that developing an ability to problem solve, gain insight and an improved mental picture of the issue at hand and you can see how going up a hill involves more than just physical exertion! (1).

### **So not time wasting then?**

Hillwalking keeps me fit and allowing myself to daydream as well may be more beneficial than I thought. Those who report more frequent daydreaming scored higher on intellectual and creative ability and had a greater capacity to think (2). So, whilst there is indeed a time and place to indulge in my ivory tower book depository, you can expect me to be working just as hard, wandering lonely as a cloud and happily floating on high over vale and hill (5). And it looks like I could even be cleverer when I get back!

(1) <https://www.frontiersin.org/articles/10.3389/fpsyg.2013.00441/full>

(2) <http://www.news.gatech.edu/2017/10/24/daydreaming-good-it-means-youre-smart>

(3) <https://www.sciencedirect.com/science/article/pii/S1053811916306425#bib64>

(4) <https://www.newstatesman.com/politics/health/2018/04/how-neuroscience-illuminating-importance-daydreaming>

(5) <http://discovermagazine.com/2017/june/let-your-mind-wander>

(6) <https://www.ncbi.nlm.nih.gov/pubmed/28705691>

(7) <http://www.pnas.org/content/early/2018/01/29/1715766115>

(8) Zull, J.E. *The Art of Changing the Brain*. (2002) Stylus Publishing: Virginia USA