

THE INFLUENCE OF MUSIC EXPERIENCE AND BODY MOVEMENT PRIOR TO IDEATIONAL FLUENCY

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ABSTRACT

The purpose of this study was to examine how shifting attention from the experience of music listening or body movement can work to overcome functional fixedness, i.e., to make people improve on ideational fluency - the ability to combine knowledge objects, or fragments of these, to form new concepts - compared to a traditional workplace meeting. The basic assumption was that music and body movement influence emotions to make people improve on ideational fluency compared to traditional meetings. The result, presented in this report, indicated that music listening suppressed functional fixedness to greater extent than a formal meeting, which in turn was a better choice compared to physical activity.

INTRODUCTION

Since the dawn of time humans' have lived in complex environments (Pickford, 2006). For millions years this meant our ancestors spent their days shifting attention between various instances, for example to find food and to avoid threats, always elaborating on future prospects. Some hundred thousand years ago, our ancestors stood on the brink of extinction (Mlodinov, 2015; The Upright Thinkers). As a consequence, creativity - a mental process where non-related objects, or fragments of these, that combines [blends] into new concepts, emerged (Pringle, 2016; Turner, 2015; Österberg, 2012). Although archeologist made several findings that could be considered products of creativity (Pringle,

Ibid), the first notably historical examples of human ability for conceptual combination is the Hohlenstein-Stadel figurine (Lion man; ~ 38 000 - 33 000 BCE) which was discovered 1939 in Germany (Wynn, Coolidge & Bright, 2009). But creativity alone cannot explain the immense innovative progress that modern humans take for granted.

11 600 years ago, due to a dramatic climate change, our ancestors seized the opportunity to erect the first known religious site - Göbekli Tepe (~9600 BCE) - in Anatolia, Turkey, to the border of Syria. They also invented agriculture. This was followed by written language (cuneiform; ~6000 BCE) which laid the ground for trade and to what was then known as science (Woods, Teeter & Emberling, 2015). For thousands of years, this development transferred from Asia minor to Tuscany in Italy where Florence became the capital for trade, finance, and higher order thinking (Goldthwaite, 2009). In the 1400s, Filippo Brunelleschi (1377-1446), a designer [known for developing a technique for linear perspective] and a polymath, constructed the Dome of the Cathedral of Saint Mary of the Flower. It is said to have been the starting point for the Renaissance. With the renaissance, the climate for prospective thinking improved further (Pinker, 2011a; Goldstein & Pinker, 2016; (Pinker, 2011b), gave room for people's openness, curiosity, and divergent thinking (Guilford, 1956; Smillie, 2017), and thus the possibility for problem solving, and workplace innovation.

The Renaissance was replaced by the enlightenment, which saw thinkers like Alexander Bain (1818-1903), Elizabeth Ricord (1788-1864), and Charles Darwin (1809-1882), among others, lay out their theories about the creative mind (Bain, 1874; Darwin, 1872; Ricord, 1840). The 1950s saw the emergence of augmented computing (which later brought us products from Apple and Microsoft), Artificial intelligence (AI) (Markoff (2015), and the Apollo project which put the frontier forward by putting a man on the moon (Garfield, 1987).

Altogether this demonstrated how humans' inborn capacity for creativity can thrive in proper "climatic"

conditions, e.g. work climate. In this study we wanted to examine how music listening or body movement prior to a complex task can influence people's ideational fluency. As control we compared the results with participants in a regular workplace meeting were assigned the same complex task.

THEORY

Even though creativity can be considered an ability common to all humans, it becomes suppressed from within somewhere between 4-7 years of age (Duncker, 1945; German & Defeyter, 2000). This suppression remains during life span and deter adult humans from spontaneously suggest ideas for problem solving at the workplace. That implies that something has to be done in order to evoke humans' inborn capacity for ideational fluency. Ellwood, Pallier, Snyder & Gallate (2009) show how shift of attention back and forth a task is beneficial for ideational fluency. Attention is the behavioral and cognitive process, taking possession of the mind in a clear and vivid form (Anderson, 2004). This is similar to, or to some extent consistent with, *Mindfulness* - the quest for the individual to consciously create options of choices and to be open for new categories and meanings (Langer, 2006). Bishop et al. (2004) have concluded on a two-component model and argue that mindfulness is "a form of mental training to reduce cognitive vulnerability to reactive models of mind that will otherwise heighten stress and emotional distress or that may otherwise perpetuate psychopathology" (p. 231). The first component involves self-regulation of attention, and the second component involves an orientation towards curiosity, openness, and acceptance, i.e. a state-like psychological process which develops thru practice. These definitions makes Mindfulness consistent with prospective thinking (Gilbert & Wilson, 2007; Schacter & Addis, 2007).

Physical activity. The findings of the Turkana boy [fossil KNM-WT 15000] provided evidence that humans have a biological predisposition for physical activity, such as pacing through the environment at high speed (Graves, Lupo, Wescott & Cunningham, 2010). Moving the limbs is thus a natural occurrence for all human beings, and if we don't move on a regular basis, the metabolism drops, providing less oxygen and nutrients to the brain. Physical activity provides such an increase of blood flow, more oxygen and nutrients, to the brain, and assist our thinking in situations that demands faster perception, decision making and problem solving. There are at least four categories of physical activities: goal-directed or explorative that can be applied by one individual alone or in a group setting (consider a two-by-two matrix). McCutcheon (1982), for example, performed a before and after test of creativity on runners. She used an adjective checklist, the aesthetic judgment scale, and a word making test. The subjects, whom contained of 18 women and ten men between 18-38 years, took the test twice with an eight week gap in between. No association between

running and creativity was found. Walking, on the other hand, seem to have an influence on idea generation in "real time and shortly after" (Oppezzo & Schwartz, 2014). Parkour (e.g. Le parcour meaning the course) emerged in the suburbs of some town in France and is considered a holistic training discipline involving running, climbing, swimming, vaulting and so forth. The purpose of the activity is either to reach somewhere or to escape from something (Puddle & Maulder, 2013). Parkour demands that the performer has an open mind to find new routes along the way.

Music listening. Humans are the only animals who make music (Kirschner and Tomasello, 2010). Music listening influence our emotions and also our cognition (Dowling & Harwood, 1986). Music is a sophisticated language that speaks to the human emotions in a mirroring *iconic* manner, that is, the music sounds like the feeling is felt (Gabrielsson, 1996). Furthermore, the listener could recognize the emotion being expressed without necessarily feeling that specific emotion (Juslin & Västfjäll, 2008). However, the music structure is often complex and could be described as consisting of *harmonical* tension and relaxation in conjunction with the *melodic* line contributing with progressive direction, and these two dimensions interact in turn with the *rhythmical* structure giving energy and momentum. These three dimensions are altogether expressions of activation (tension) or deactivation (relaxation), (Sloboda, 1985). Dowling and Harwood (1986) describe music listening as riding a bike. Automated processes take over the execution until something unexpected happens to be tackled by conscious actions. In music listening this unexpectedness can occur from harmonical, melodic and/or rhythmic change. According to Mandler's (1984) theory of emotion this change activates cognitive processes that evaluate the sensation, give it meaning and generates emotion. However, Berlyne's (1971) account of emotional response to music argues that the emotion itself is the goal for many listeners, i.e. it is not so much about interpretation and meaning as it is a need to keep oneself on a moderate level of arousal. The composer can use the listener's memories of connections between sensory impressions and a specific sound, that is: *index* (cf. conventions) as well as musical components that *symbolizes* the corresponding components that make up a particular emotional state (Dowling & Harwood, 1986; Juslin & Västfjäll, 2008). This suggests that those engaged in some sort of musical activity, such as music listening, can be expected to be stimulated - socially, cognitively and emotionally (Köping Olsson, 2008). Based on this understanding of the influence of music on humans as described briefly above, we wanted to examine how ideational fluency was influenced by music listening.

The *purpose* of this study was to examine how music listening or body movement respectively influence ideational fluency. We cannot know to what extent a respondent is paying attention to the music or the

physical activity per se, but we are convinced that their mind is not occupied with the task we will assign them later. That situation equals coming to work and during the day being assigned with an unprepared complex task, which implies we can simulate workplace problem solving. Thus, our hypothesis is: Musical listening and Parkour will have a greater impact on ideational fluency compared to a formal meeting.

METHOD

PARTICIPANTS

Thirty six people, 19 women (Mean age = 39.15; SD = 10.22) and 17 men (mean age= 46; SD= 11.68), participated in the experiment. Ten people (5 men and 5 women) participated in music listening, 13 people (8 women and 5 men) “Parkoured”, and yet another 13 people participated in seminar session – constituting the control group. Participants in the trials for music and Parkour were recruited at *European Institute for Outdoor Adventure Education and Experiential Learning* (EOE) conference that was held at GIH in Stockholm in 2013. The control group consisted of people from a mid-sweden University. Thus, they are all associated to the culture of higher learning (lecturers or researchers that is).

MATERIALS & PROCEDURE

We used three different set-ups as preparation for the experiment: music listening, Parkour, and participating in a traditional workplace meeting as the control. In the first trial, a piano was used, placed in a room in the basement. For the Parkour trial, a gym hall was used. For the control, a traditional conference seminar was used. The creativity experiment was based on a paper and pencil test. The construction of the test was influenced by Finke, Pinker & Farah (1989) and Hocevar (1979, 1980). In Finke et al., the letters J and D were used to assess imagery. Hocevar studies, on the other hand, concluded idea frequency to be a key factor for creativity. Therefore, we asked the subjects to produce as many meaningful combinations out of the letter J and D during a period of five minutes. The instruction was: *form as many meaningful things as possible. If you do not understand what to do or become unsure, you can make your own interpretation or take chances.* For judgment of each response, we applied Amabile’s (1982) principles for consensual assessment technique (CAT), meaning that each result should be evaluated by an expert within the field. We consider both of us to fulfill that requirement, and thus, one of us took the role of the evaluator.

Trial 1. The subjects were gathered in a basement of a conference hall. The measures of the room were three times five meters. Three walls were white and the fourth one was made of glass. About 18 red chairs were placed around a piano. The subjects were asked to sit down as comfortably as possible and listen passively for 15 minutes while Dr Köping Olsson performed three pieces of music in succession on the on piano. The three music

pieces was Winter Games by David Foster, Armando's Rhumba by Chick Corea and Shenandoah (Traditional folk song) as played by Keith Jarrett. As they were performed with the same instrument in the same environment the circumstances were constant while the musical character differed in several ways. The first piece is joyful and challenging, composed originally for a symphony orchestra to the opening ceremony of the Olympic Games and expresses intense powerfulness in a marching character in F- major. The second piece of music is a more harmonious intricate Spanish-inspired composition for small jazz orchestra. This music has also a rhythmic drive and expresses playfulness and ingenuity. The last performed piano piece is a traditional American folk song which expresses meditative melancholy and calm thoughtfulness. Through the performance of music and the order of the pieces the listener was intended first to be brought into presence in the situation and feeling of being welcomed. Secondly, the music would bring delight and focused attention through the music’s appeal. Finally, the idea was that the listener would be lulled into a resting and emotionally safe atmosphere. When the music ended the test was distributed.

Trial 2. We used a traditional gym hall, which with Swedish measures can host activities such as basketball, volleyball and so forth. Various equipments were arranged in the gym hall, following the tradition of Swedish child play “skeppsbrott” (shipwreck) but is was referred to as Parkour. In this game, participants are instructed to jump between obstacles without touching the floor. Those who failed and touch the ground is out of the game. Two instructors presented different optional “Parkour”-activities, and then the participants practiced these options for about thirty minutes. No music was played during the session.

Control group. People at a work-conference at a University sat passively and listened to traditional presentations from one person.

Data-analysis: Descriptive statistics, including one way ANOVA, was applied.

RESULTS

The result indicated that passive music listening exceeded traditional meeting setting, which in turn exceeded Parkour to influence ideational fluency ($F=2.32$; $p<.05$; see table 1).

Further, no significant correlation was found between age and ideational fluency ($r = .03$), or sex and ideational fluency ($r = -.04$).

Table 1. Descriptive statistics

Activity	Age		Sex		Frequency	
	Average	SD	Average	SD	Average	SD
Music	43.60	11.86	1.50	.53	4.80	2.94
Parkour	38.92	11.41	1.38	.51	2.54	2.57
Passiv	45.15	10.68	1.54	.52	3.69	2.06

DISCUSSION

The result indicated that attending music listening seem to be a better preparation for ideational fluency compared to having a formal meeting, which turn is better than performing physical activities (Parkour). We were a bit surprised over the result, because we hypothesized that music listening and physical activity both would outperform a formal meeting. We contemplated over various ways to understand why it fell out the way it did.

One such factor is time for preparation - time used for Music listening, Parkour and workplace meeting (control group). The purpose with time for preparation was to make people become mindful prior to the creativity exercise. That means cleaning your mind to become orientated towards curiosity, openness and acceptance. We controlled the time frame for music listening, but we had no control over time used for Parkour or the control group because these activities was already planned when we joined in. Those who participated in music listening had fifteen minutes to become mindful before shifting attention towards the test. The Parkour-group used twice the time – thirty minutes – whereas the control group used more than an hour. Even so, correlation analysis failed to confirm any relation between time for preparation and ideational fluency ($r = -.08$).

Another factor was about representativeness of the control group. We did not sample a control group from the participants at the EOE - conference. Instead, we thought, if the effect should have a general application, it wouldn't matter if we sampled people elsewhere afterwards. Based on that premise, we sampled people with a similar professional profile as the EOE – participants from another university some weeks later. But when we scrutinized the group in detail, we realized that they were not typical academics but instead specialists on the topic of interest - creativity. Some of them had taught on the subject for years. A conclusion from that was that they may have been outliers.

Mindfulness is a hot topic. Over the past years, there is an almost exponential increase of publications on Mindfulness (PSychInfo). The original practice of Mindfulness was applied within the eastern religion among Buddhists. In the western world, the concept has transformed to an application in contemporary psychology to improve awareness and to regulate emotions. Unlike transcendental meditation, in which a mantra is repeated to facilitate restful alertness, mindfulness training involve guided attention and unstructured mental activity (Langer, 1992, p. 297). Langers dual distinction mindfulness/mindlessness, describe two types of processing modes. Mindfulness is a state of conscious awareness in which the individual is implicitly aware of the context and diverse content of information, whereas mindlessness refers to automaticity, habit or functional fixedness, i.e. when alternatives never reaches consciousness (Langer, 1975; 1989).

With the perspective of mindfulness meditation Van Dam et al. (2017) claimed that mindfulness lack effect. In their study mindfulness is defined as focusing on the present, i.e. perception on what is now.

We applied a different approach which is consistent with the function of the mind - propection (Bishop et al, 2004; Gilbert & Wilson, 2007; Langer, 2006 Schacter & Addis, 2007). Instead of asking people to perceive the present, our ambition was to make their mind automatically initiate elaboration of future prospects.

Why didn't physical activity outperform a formal meeting? A recent study that used multimodal brain imaging (rs-fMRI) to study the association between physical activity and the association various cognitive functions revealed an improved episodic memory (Flodin et al. 2017). That means a better memory for "knowing my starting point". It make sense from an evolutionary perspective; in order for the Nariokotome Boy to be able to return safely to the starting point after exploration of the extent parts of the savanna, it was probably good to be aware the whole episode. Episodic memory is associated to creativity, if episodic-specific information is induced prior to the creative event (Madore, Addis, and Schacter, 2015). But, we didn't induce any episodic information prior to the task. Therefore, like Flodin et al. (2017) has demonstrated, the subjects we used may have improved on remembering episodic information, nut not necessarily ideational fluency.

Music listening had the greatest impact on ideational fluency. And for good reason. Music listening goes back at least 500 000 years (Dunbar, 2014), and has a positive effect on open mindedness (Kirschner and Tomasello, 2010). Our reasoning is that music listening reach the mind on an implicit emotional level (Gabrielsson, 2010) and activates the mind, regardless of music style preferences (Dowling & Harwood, 1986).

FUTURE RESEARCH.

We reflected on the control group, wondering what would happen if we used respondents who was not specialists on the topic of interest - creativity?

Anyway, both the effects of music listening and different forms of motion on ideational fluency need to be further explored, there for example, the subjects' music preferences are taken into consideration.

How working meetings can be conducted more effectively by strategically shifting participants attention also need further investigation.

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