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InMI and its potential originality – musical creativity in composers’ minds

ABSTRACT: The current article explores the potential innovativeness of Involuntary Musical Imagery and presents the current state of InMI researches. There is a lack of precise definition of the term, as well as related terms (such as earworm or musical imagery). InMI is often equated to earworms which does not do justice to its creative potential.

Several authors suggest that InMI can be a source of new melodies useful for composers in their composition process. The article proposes that InMI can consist of new melodies and appear as a single event. Composers use their working memory and musical abilities to volitionally loop the tune in their head, then transcribe it into external realm (notation, recording). Composers can later use it in their creative process. The use of InMI in composing is a matter of individual differences between composers.

KEYWORDS: Involuntary Musical Imagery, creativity, unconscious cognition, spontaneous creativity.

The studies of mental imagery in its various forms have been developed since the 1920s and began to accelerate in the last two decades. Internal auditory phenomena appear in scientific works under many names: inner ear, internal hearing, internalized sound, mind’s ear, audiation (Covington, 2005). Together with visual imagery they are the fastest growing branch of psychological research on mental imagery. The auditory imagery, which is the least colloquial of the terms referring to all of the internal aural sensations, includes musical imagery. Two subtypes can be identified in the latter: Voluntary Musical Imagery (Zatorre & Halpern, 2005) and Involuntary Musical Imagery (InMI; Liikkanen, 2008). The aim of this paper is to present existing definitions of InMI in the current literature, in order to delineate the theoretical assumptions of its research and further consider potential creativity of InMI in composition process.

The studies devoted to Involuntary Musical Imagery use methodologies that range from diary studies (Beaman & Williams, 2010; Halpern & Bartlett, 2011), introspective questionnaires (e.g. Halpern & Bartlett, 2011; Wammes & Barušs, 2009), interviews (Floridou, 2015; Williamson & Jilka, 2014); self-reported case

studies (Brown, 2006), case studies (Warren & Schott, 2006), ESM (Bailes, 2006, 2015; Floridou & Müllensiefen, 2015; Lancashire, 2017), big data analysis (Liikkanen, Jakubowski, & Toivanen, 2015), experiments (Hyman et al., 2013), as well as PET study (Zatorre, Halpern, Perry, Meyer, & Evans, 1996). The existing body of work covers many aspects of InMI: the occurrence in the general population, characteristics of InMI, methodologies serving to explore the phenomenon, phenomenology of InMI, but also its links to psychopathology and neurological bases (Liikkanen, 2018). InMI is as well being scrutinized under psychoanalytical (Lipson, 2006; Nass, 1975, 1984) and psychotherapeutic angle (Hemming & Merrill, 2015; Liikkanen & Raaska, 2013). Nevertheless, up to date there have been only a few studies devoted to the creative potential of these internal melodies and their use in the composition process. The ambiguity of definitions used in the body of work on InMI and related concepts (Table 1) additionally hinders viewing internal musical phenomena as potentially creative.

Due to the abundance of theoretical texts and experiments (Table 2), certain problems with the terminology and definition inaccuracies have arisen. InMI in the present article is defined as internal experience of musical phrase(s) which is not objectively playing in the environment (Cotter, Christensen, & Silvia, 2016; Intons-Peterson, 1992); which is not an outcome of conscious reflection and which appears spontaneously, unexpectedly and involuntarily. It can nonetheless be wanted and experienced as pleasant. The terms that share some traits or are often confused with InMI are: musical mind pops (Elua, Laws, & Kvavilashvili, 2012), sticky tunes (Sacks, 2007; Williamson, Liikkanen, Jakubowski, & Stewart, 2014), sticky music (Sacks, 2007), cognitive itch (Kellaris, 2001), cognitively infectious musical agents (Sacks, 2007), catchy tunes (Beaman & Williams, 2010), obsessive songs (McNally-Gagnon, Hébert, & Peretz, 2009), intrusive songs (Hyman et al., 2013), brainworms (Sacks, 2007), stuck song syndrome (Kellaris, 2003; Levitin, 2006), stuck songs (Beaman & Williams, 2013; Moseley, Alderson-Day, Kumar, & Fernyhough, 2018), tune in the head (Liikkanen, 2012a), tune on the brain phenomenon (Liikkanen, 2011); musical ear syndrome (referring to a pathology, yet its definition overlaps with InMI; Pestel, 2017), Musical Imagery Repetition (MIR; Bennett, 2002), Spontaneous Musical Imagery (Wammes & Barušs, 2009). The differences between InMI and auditory pathologies were delineated in the classification by Liikkanen (2012a, 2012b; but see: Williams, 2015). Some of the issues related to confusing descriptions of InMI were addressed by Williams (2015). The most common name related to InMI is now the term 'earworm'. 'InMI' and 'earworm' are used interchangeably by many authors (e.g. Beaman & Williams, 2010, 2013; Cotter et al., 2016; Farrugia, Jakubowski, Cusack, & Stewart, 2015; Floridou, Williamson, & Müllensiefen, 2012b; Floridou, Williamson, & Stewart, 2017; Floridou, Williamson, Stewart, & Müllensiefen, 2015; Hemming & Merrill, 2015; Jakubowski, Finkel, Stewart, & Müllensiefen, 2017; Lancashire, 2017; Liikkanen, 2011; Liikkanen et al., 2015; Müllensiefen et al., 2014; Weir, Williamson, & Müllensiefen, 2015; Williamson et al., 2011, 2012, 2014; Williamson & Müllensiefen, 2012). By doing so, they conflate the superordinate category (InMI) with one of its examples (earworm; Williams, 2015). Earworms are merely a possible type of InMI – InMI cannot be

reduced to earworms (Cotter et al., 2016; Moseley et al., 2018; Williams, 2015). Due to the lack of agreement on the relation between the two terms further research may become compromised (Williams, 2015). In the current paper, the following classification is being used: auditory imagery is a broader category which includes musical imagery, which in turn encompasses InMI (Williams, 2015; Figure 1).

Table 1: Terms related to InMI

Type of name	Examples
tactile metaphors	sticky tunes (Sacks, 2007; Williamson et al. 2014), sticky music (Sacks, 2007), cognitive itch (Kellaris, 2001), stuck songs (Beaman & Williams, 2013; Moseley, Alderson-Day, Kumar, & Fernyhough, 2018), stuck song syndrom (Kellaris, 2003; Levitin, 2006)
related to pathology	obsessive songs (McNally-Gagnon, Hébert, & Peretz, 2009), intrusive songs (Hyman, Burland, Duskin, Cook, Roy, McGrath, & Roundhill, 2013), musical ear syndrome (Pestel, 2017)
neuroanatomical	brainworms (Sacks, 2007), tune on the brain (Liikkanen, 2011)
referring to musical imagery	Musical Imagery Repetition (Bennett, 2002), Spontaneous Musical Imagery (Wammes & Barušs, 2009), earworm (Liikkanen, 2008), musical mind pops (Elua, Laws, & Kvavilashvili, 2012)

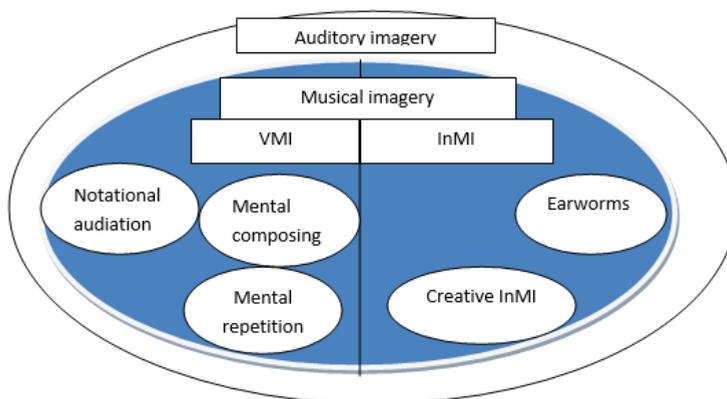


Figure 1. Auditory imagery and its subtypes

Equating InMI and earworms has its repercussions for the theoretical bases of the research, especially when it comes to perceiving InMI as a potential source of musical ideas. Firstly, earworms' crucial characteristic is repetitiveness, e.g. in the definition used by Williamson and colleagues 'a tune comes into the mind and repeats without conscious control' (2012, p. 259). Earworms are tunes that are familiar to the subject (Beaman & Williams, 2010), and hence heard before – which excludes the outbursts of novel melody. In the same vein researchers often put strong emphasis on data from involuntary memory researches, without referring to subjects such as mind-wandering, stimulus-independent thought and insight (e.g. Baird et al., 2012; Beaman, Powell, & Rapley, 2015; Floridou et al., 2012; Williamson et al., 2011; Williamson & Müllensiefen, 2012). Until a certain point in time the majority of researchers assumed that earworms (and hence also InMI, as the two were not differentiated by these authors) provide an unpleasant and unwanted sensation (Beaman & Williams, 2013; Hyman et al., 2013; Kellaris, 2008; Levitin, 2006; but see for counter examples: Bailes, 2007; Beaty et al., 2013; Floridou & Müllensiefen, 2015; Halpern & Bartlett, 2011; Hemming, 2009; Huovinen & Tuuri, 2019; Hyman et al., 2015; Moseley et al., 2018), some suggesting that the subjects undertake actions to suppress the experience (e.g. Liikkanen, 2018). The adjective 'intrusive', which evokes negative connotations, is used in relation to InMI in some scientific writings (e.g. Hyman et al., 2013; Hyman et al., 2015) and the term 'intrusion' is a part of certain definitions of InMI (e.g. Beaman & Williams, 2010; Williamson et al., 2011). These notions result in a limited number of studies that assume the potential novelty of the melodies experienced as InMI.

Some scholars underline that musical imagery in general is an important tool for composers (Agnew, 1922; Bailes, 2007; Cowell, 1926; Floridou, 2015; Lancashire, 2017; Mountain, 2001; Retra, 1999). This becomes vital for the composers who had lost their hearing, yet continued to create music relying on an internal composition process. These were the cases of Beethoven, Smetana (Zatorre & Halpern, 2005). The current research focuses, nonetheless, on the deliberate mental practice of musicians e.g. instrumentalists rehearsing a piece in their mind (Huovinen & Tuuri, 2019; Lancashire, 2017).

A sudden moment of musical imagery that brings inspiration to compose was described already in the early writings in composition studies (Bahle, 1936; Benham, 1929). Those texts linked auditory imagery with composing creativity (Agnew, 1922; Benham, 1929; Cowell, 1926) and some even suggested that auditory imagery was involved in the initial appearance of a musical idea (Benham, 1929). The notion of subconscious activity being present in the creative process with later voluntary reflection was present already in the 20th century works (Agnew, 1922; Benham, 1929; Cowell, 1926; Wallas, 1926). It is Wallas who coined the term Incubation – the break from thinking about creation or a problem to solve – which is an ongoing subject of research (Sadler-Smith, 2015). It is now a widely agreed consensus that composing involves conscious and unconscious cognition (e.g. Sloboda, 1985). Furthermore, already back then the scholars highlighted individual differences that occur between composers in their composing strategies and the degree to which they would use the subconscious, sudden ideas in the

process (Agnew, 1922; Bahle, 1947). These works are widely quoted nowadays, yet the contemporary academics do omit the creative aspect of auditory imagery, instead suggesting that the early authors referred to mere voluntary use of mental imagery in composing (e.g. Cotter, Christensen, & Silvia, 2018).

Scholars do quote composers' accounts which mention the sudden internal hearing as a vital part of their composing (e.g. Agnew, 1922; Zatorre & Halpern, 2005). Rather than structured case studies, they have a form of a news column curiosity hence they are regarded as mere anecdotes (Hubbard, 2010). In turn, there are individuals that are hypothesised to be constantly hearing new music in their internal realm in an obsessive manner (such as Smetana, Ravel, Haydn; Covington, 2005) as well as a self-reported case study such as Brown (2006), even though the author of the latter admits these are rare even among musicians and composers. Musical hallucinations in musicians can also reveal novel melodies (Warren & Schott, 2006). The frequency of hearing internal involuntary tunes is higher in the following cases: (1) individual defines him/herself as a musician (Liikkanen, 2011); (2) individual received musical training (Beaty et al., 2013; Liikkanen, 2011; Floridou, Williamson, Stewart, & Müllensiefen, 2015; Hyman et al., 2013); (3) being involved in musical activities on the given day (Liikkanen, 2011); (4) subjective importance of music in one's life (Beaman & Williams, 2010).

Several authors suggest that InMI can be a source of new melodies useful for composers in their composition process (Agnew, 1922; Bailes, 2002, 2006, 2007, 2009; Bailes & Bishop, 2012; Beaty et al., 2013; Benham, 1929; Brown, 2006; Covington, 2005; Cowell, 1926; Floridou, 2015; Liikkanen, 2012a; Lipson, 2006; Mountain, 2001; Nass, 1975, 1984; Wammes & Barušs, 2009; Williamson & Jilka, 2014). This is seldom explicitly denied (but see: Lancashire, 2017), yet often the implicit assumptions stand in the way of viewing InMI as potentially creative. Some of the articles are ambiguous when it comes to the originality of InMI: on the one hand they explicitly write that it is possible, on the other they limit InMI to earworms (which are repetitive and previously known by the most common definition; Cotter, Christensen, & Silvia, 2018; Lancashire, 2017; Floridou, 2015). Authors Beaman and Williams explicitly stated that the way the questions were formulated in their interview did not allow the participants to talk about the creativity of their InMI (2010). It is also worth noting that researchers use the term 'original' when describing tunes without explaining what they refer to: the originality (creativity) of the internal tune that occurred for the first time or hearing their previously composed tune as an earworm (Bailes, 2015).

A new idea in an artist's mind might not only consist of the general topic or motivation to improvise – it can also be a musical theme (e.g. painters can have visual ideas for their paintings). This is also the case of composers – they know how to use the original tunes for their creative purposes (Thrash et al. 2014). The music that 'plays' in our heads, called musical imagery, is for the sake of the current article defined as follows: 'introspective persistence of an auditory experience (...) in the absence of direct sensory instigation of that experience' (Intons-Peterson, 1992, 46) or in other words – 'hearing music inside your head

that isn't playing in the environment' (Cotter, Christensen, & Silvia, 2018, n.p.). The phenomenon takes place in the absence of psychopathology or hearing impairments (Hemming & Merrill, 2015; Floridou, 2015; but see: Williams, 2015) – or more precisely it does not result directly from the aforementioned causes. The internal music is spontaneous, involuntary (Williamson et al., 2011) and not preceded directly by a reflection upon composing.

The phenomenon consists in the internal music appearing without conscious control (Beaman & Williams, 2010; Williamson et al., 2011). Some scholars include repetitiveness of the internal tune in the definition of InMI (Beaman & Williams, 2010; Floridou, 2015; Floridou & Müllensiefen, 2015; Floridou et al., 2015; Jakubowski et al., 2017; Liikkanen, 2008, 2009, 2011; Williamson & Jilka, 2014; Williamson et al., 2011), while the current article argues it can occur as a single event (e.g. Kvavilashvili & Anthony, 2012; Williams, 2015).

It is worth underlining that composers' Involuntary Musical Imagery can go beyond 'earworms'. Such occurrence was often reported by musicians. InMI can be potentially innovative – the internal tunes can consist of new melodies (Agnew, 1922; Bailes & Bishop, 2012; Bailes, 2006, 2007, 2009, 2015; Beaty et al., 2013; Covington, 2005; Cowell, 1926; Mountain, 2001; but see: Jakubowski et al., 2017) and can appear as a single event (not repeatedly; Elua, Laws, & Kvavilashvili, 2012; Liikkanen, 2011). Composers use their working memory and musical abilities to volitionally loop the tune in their head, to later transcribe it into external realm (notation, recording). The accuracy and the ease of externalisation of the inner music varies from one occurrence to another (Floridou, 2015; Brown, 2006). Composers can use the melodies revealed through internal musical experience in their creative processes. The use of InMI in composing is a matter of individual differences between composers (Agnew, 1922; Bahle, 1946). Composing consists of both volitional and spontaneous imagery. Importantly, a myth surrounding sudden creative ideas going 'from mind to paper' (Mountain, 2001) and the idea of completely endogenous, absolute music (Covington, 2005) hinders proper understanding of musical creativity. Scholars point out possible moments in which the probability of InMI rises: these are so called low attention states with low cognitive load and engagement, as well as defocused attention (Bennett, 2003, Williamson et al., 2011). There are also a few researchers reporting composing while dreaming (Brown, 2006; König et al., 2018; König & Schredl, 2019; Olbrich & Schredl, 2019; Uga, Lemut, Zampi, Zilli, & Salzarulo, 2005; Williamson et al., 2011) – an example of the spontaneous creativity of our brains.

Table 2: Overview of articles referring to InMI and related concepts from the last two decades.

Author and year	InMI = earworm	Potential creativity	Repetitiveness in the definition	Unpleasant
Bailes, 2002		+		
Bailes, 2006		+		
Bailes, 2007		+		–

Bailes, 2009		+		
Bailes, 2015		+		
Bailes & Bishop, 2012		+		
Beaman & Wil- liams, 2010	+		+	
Beaman & Wil- liams, 2013	+			+
Beaty et al., 2013		+		-
Brown, 2006		+		
Cotter, Chris- tensen, & Silvia, 2018	+ (although InMI is described as super- ordinate category)	ambiguous		
Covington, 2005		+		
Farrugia et al., 2015	+			
Floridou, 2015		ambiguous	+	
Floridou & Müllen- siefen, 2015			+	-
Floridou, William- son, & Müllensiefen, 2012a	+			
Floridou, William- son, Stewart, & Müllensiefen, 2015	+		+	
Floridou, William- son, & Stewart, 2017	+			
Halpern & Bartlett, 2011				-
Hemming, 2009				-
Huovinen & Tuuri, 2019				-
Hyman et al., 2013				+
Hyman et al., 2015				-
Jakubowski et al., 2017	+		+	

Kellaris, 2008				+
Lancashire, 2017	+	ambiguous		
Levitin, 2006				+
Liikkanen, 2008			+	
Liikkanen, 2009			+	
Liikkanen, 2011	+		+	
Liikkanen, 2012a	-	+	-	
Liikkanen, 2012b	-		+	
Liikkanen, 2012c	-		+	
Liikkanen, Jakubowski, & Toivanen, 2015	+			
Liikkanen, 2018				+
Moseley et al., 2018				-
Müllensiefen et al., 2014	+		+	
Wammes & Barušs, 2009		+		
Weir, Williamson, & Müllensiefen, 2015	+		+	
Williamson et al., 2011	+			
Williamson & Müllensiefen, 2012	+			
Williamson & Jilka, 2014		+	+	

For the last two decades musical imagery became a point of interests to researchers. Due to the novelty of the field and the number of publications concerning InMI, there is still a lack of precise definitions of the term, as well as related terms (such as earworm or musical imagery). A consensus must be reached especially in defining the major term – InMI. The researchers of the phenomenon should be precise and explicitly define the terms used in their articles to avoid confusion. The matter of potential innovativeness of InMI is just one of the matters that lose out due to the current lack of systematization of the terminology.

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