Involuntary Music Among Normal Population and Clinical Cases

There is a new topic in general psychology called involuntary musical imagery (INMI). It is of great potential interest to practitioners of clinical neuroscience because of its notable similarities to clinical involuntary music frequency and duration of involuntary experience of reliving a musical memory without deliberately attempting to do so. It is also known by other colloquial names such as earworms, sticky tunes, or tune in the head phenomenon. In this paper, I review recent empirical findings on the topic of involuntary music, highlighting how the findings from INMI research in the normal population may support the diagnosis of involuntary music in clinical practice.

It is proposed here that involuntary music involves a continuum of musical imagery phenomena, like the perceptual continuum proposed for hallucinatory perceptions. These phenomena range from common, “normal” involuntary music to pathological conditions (see Figure 1), such as musical obsessions, hallucinations, and palinacousis. This review includes involuntary imagery phenomena from three disciplines: general psychology (specifically music), clinical neuroscience, and psychodynamic psychology.

Involuntary music in general psychology

The human capacity to imagine sounds is generally called auditory imagery and musical imagery when it involves music. Involuntary musical imagery is considered to be a manifestation of musical imagery with uncontrolled onset of imagery. This review is focused on INMI. As a subjective experience, INMI involves insight that the music is self-generated and its quality is not very vivid, in comparison to the perception of stimulus.

The first psychology paper related to INMI came out in 2004 when Kivvishvil and Mandler reported a series of studies on involuntary semantic memories. Melodies were found to be the most frequently recurring memory type which people recall unintentionally. Since this seminal work, researchers have been interested in the frequency and duration of involuntary music, along with the phenomenology and dynamics of INMI.

There is a high prevalence of INMI in everyday life. An experience sampling study of musicology majors revealed that the students are deeply immersed in both voluntary and involuntary imagined music throughout the day. A questionnaire study of over 1,900 Finnish respondents mentioned by subjects that almost 90% of respondents experienced INMI every week (see Figure 2). In another recent study, a diary method was used for data collection over a four-week period. The INMI episodes lasted 25 minutes on average and happened more than once a week. The conscious experience of INMI varies considerably between people. For instance, despite the higher likelihood of certain songs being reported as INMI, the songs are very idiosyncratic overall. In the Beeman and Williams diary study, 74% of INMI reports involved a unique song. The songs can be old, contemporary, or even completely novel. Experiences of new, self-generated songs are more frequent among musically educated people. Features of the musical experience have also been examined. In the study of Finnish internet users, an INMI episode was typically contemporary, lyrical, and involved only a fraction of a song, presumably the chorus. The study found that the frequency and characteristics of the experience are influenced by age, gender, and musical dispositions. Women reported experiences more often as did the younger cohorts. The frequency of musical activities correlated positively with the frequency of INMI experiences.

The causes of INMI are pretty much as yet unknown. The hypotheses often involve the function of memory in terms of enforcing and decaying activation in semantic memory networks. It is hypothesised that the activation of memory through recall, recognition, or cross-modal memory associations can evoke these experiences immediately or after a delay. A study of INMI triggers identified several common categories of triggers. Exposure to music, recent and repeated, was the most prominent category but cross-modal associations to music, and affective states were also frequently mentioned by subjects. Further evidence about the role of memory activation comes from the only experimental study of
INMI published thus far. Using a novel induction technique, it was found that the proportion of recently processed music among INMI reports increased in response to cueing. Familiarity with music was a necessary but not a sufficient condition for the emergence of INMI. The relative freshness of the song was important for its later induction, contemporary songs being more powerful cues than classic ones. The interpretation was that the repeated activation facilitates later, intentional or unintentional, imagination of music.

**Involuntary music in clinical neuroscience**

Several conditions in neurology and psychiatry involve symptoms very much like INMI, but are much more pronounced. For this review, I have included the most relevant phenomena with a known cause: peripheral nervous system, brain damage and functional diseases.\(^{13}\) Additionally, intoxication and epilepsy are known to sometimes trigger these symptoms.\(^{3}\) A rare phenomenon known as palinacousis has also been documented.\(^{4}\) It involves an auditory illusion of persistence of sound impressions after the cessation of the auditory stimulation, sometimes music. This condition is related to brain damage and epilepsy and should not be confused with other types of involuntary music.

Involuntary music is sometimes associated with obsessive-compulsive disorder (OCD) and schizophrenia. For OCD so-called musical obsessions\(^{14}\) in the absence of other psychopathological symptoms, can be an adequate criterion for diagnosis when accompanied by subjective distress and dysfunction. For instance, Zungu-Dirway and colleagues\(^{5}\) described two patients who perceived the internally created music as intrusive, irritating and disruptive of other thought. The sole difference in the phenomenology of musical obsessions to INMI is their noticeable disruptiveness.

Hallucinations, including musical ones, are typical in schizophrenia. Musical hallucinations are more common than musical obsessions, even though they occur in less than 0.2% of hospital populations and typically involve elderly females.\(^{15}\) Among the researchers studying schizophrenia, there has been a long discussion about musical hallucinations and pseudo-hallucinations.\(^{16}\) For instance, Tenao and Ikemura\(^{17}\) disagreed with the aforementioned musical obsessions diagnosis.\(^{3}\) They preferred to call the condition pseudo-hallucinations because the hallucinations (music) were perceived in the subjective space and were under limited conscious control.

Reduction or loss of hearing can trigger auditory hallucinations.\(^{18}\) This is sometimes called an auditory Charles Bonnet syndrome or auditory release hallucinations. The common denominator with these often elder people is that their otherwise impoverished auditory consciousness becomes occupied with hallucinatory perceptions, in some cases music. Subjects usually have insight into the hallucinatory nature of their experiences. These conditions seem to relate to a lack of excitation to cortical auditory areas and limbic regions, as if the intact auditory cortices have become hypersensitive due to sensory deprivation.\(^{19}\) Brain damage or brain stimulation can alter normal musical processing and create involuntary music experiences. For instance, a brain stem lesion induced a temporary hearing loss and accompanying musical hallucinations in a middle-aged man.\(^{20}\)

**Involuntary music in psychodynamic psychology**

Freud was known for his indifference to music, unlike many of his followers. For instance, Reik, a psychotherapist and a scholar, was convinced that involuntary musical memories had a function in the service of psychoanalysis.\(^{21}\) He believed that the INMI experiences of the analyst and the patient carried a hidden message about the workings of psyche, which the analyst could perceive and benefit from in the clinical work. Another hypothesis on the function of INMI portrays music as a substitute for the presence of a mothering person, comparing the role of music to the role of dreams in Freud’s theory. This idea finds some support in the trends of popular culture. Hannett\(^{22}\) studied the lyrical contents of 2113 hit songs from the first half of 20th century. Of these, 69% were classified as romantic love songs. The domination of love songs in the sample was interpreted as reflecting the universal need for love and passion, particularly that the popular lyrics express “unconscious infantile affections...or partial attachments to the image of preoediap mother”, according to Hannett.\(^{23}\)

**Implications for practice**

This review has illustrated involuntary music phenomena from harmless, common forms to troublesome clinical conditions. I proposed that there is a continuum of pathological musical involuntary music, with a variable degree of commonality and severity. It seems that the phenomenology of INMI and music-related mental disorders have much in common. INMI presents a case of intact self and reality monitoring (insight), but inadequate control of conscious thought. Regarding the latter, there is little evidence to support the suggestion that the use of mental coping strategies,\(^{24}\) for instance intentionally replacing an INMI
song with another (musical displacement strategy), are effective in modulating the frequency, duration, or disruptiveness of INM.

An important characteristic of INM is huge interindividual variability. Even though nearly everyone has experienced it, the frequency and the nature of the experience is different from person to person. It is noteworthy that the majority of people experiencing INM several times a day find it compatible with everyday life. An interesting parallel between INM and musical hallucinations is the female preponderance, although this is not characteristic of mental illness such as schizophrenia in general. For clinical practice, it is important to understand that even nearly constant, involuntary musical imagery may not indicate mental disorder if it does not impede everyday life. I believe future work on the topic is needed to clarify diagnostic criteria for OCD and schizophrenia to distinguish their features from “normal” INM. Thus far, brain research techniques successfully used for imaging voluntary imagery and hallucinations have not been able to capture INM, but we can hope future efforts will bring insights from the neural level to help diagnose involuntary music phenomena.

References