

## Introduction

Sensory and cognitive intrusions have been reported as lingering effects of the use of interactive media and peripherals. These intrusions are here named as **Tech-Induced Intrusions** (sensory and cognitive) and **Motoric Activations** (involuntary movements of limbs) (TIIMA) as overall phenomena.

Interestingly, perceptual anomalies (e.g., positive afterimages, distortions) that initially emerge during drug intoxication, but re-occur and persist long after ceasing taking the drug are considered a psychiatric disorder (i.e., **Hallucinogen Persistent Perceptual Disorder**) when they cause clinically significant distress or impairment in some area of functioning.

Can TIIMA undermine mental health or pose risks if they are experienced recurrently, for long periods of time, under certain circumstances or are negatively interpreted?

## Objective

To conduct a literature review into TIIMA focusing on: i) phenomenology, ii) characteristics and, iii) risk factors and consequences.

- Mobile phone use: “Phantom Phone Sensations”, Ringxiety. Total papers: 13.
- Video games: “Game Transfer Phenomena” (GTP). Total papers: 8.

## Historical Background

**1995**: The earliest reference of “voluntary or involuntary typing movements of the fingers” was satirically proposed as a diagnostic criteria for Internet addiction disorder by Goldberg.

**2000**: Playing a game as a novel task was used to induce stereotypical sensory images during hypnagogic state (i.e., transitional state from wakefulness to sleep).

**2007**: Re-experiencing vibrations from mobile phones was identified among emotional/behaviour problems of mobile phone use and coined as Ringxiety by Laramie.

**2010**: Seminal interview study where GTP was coined by Ortiz de Gortari - gamers reported seeing images (e.g., health bars above people's heads, and menus during conversations) and a variety of thought intrusion and involuntary behaviours.

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## Preliminary results

- TIIMA is highly prevalent among mobile phone users (35%-89%) and gamers (82%-97%).
- A minority reported negative consequences: e.g., feeling bothered, frustration, questioning own sanity, and distress/dysfunction and risk-taking behaviours in GTP.
- Common among non-clinical population and not explained by drug use.
- Minors and young adults, those with mental disorders are more prone, and no gender differences have been found.
- Associated with recurrent use, prolonged gaming sessions, Gaming Disorder, problematic mobile phone use, anxiety, depression, fatigue, high anticipation/anxiety for receiving calls/messages or finding game characters, emotional reaction to messages/game outcomes, conscientiousness, neuroticism, extraversion.
- **Etiological hypotheses**: memory pathways, neural adaptations, excitatory neurotransmitters, attentional bias toward salient cues, conditioning behaviour, misinterpretation of sensory signals.



**Terms**

**Phantom Phone Sensations, Ringxiety, etc.**

**Medium**

Mobile phones.

**Variety of intrusions**

**Alerts from messages and calls**: vibrations, re-experiencing ringing, misperceiving sounds, images, tactile sensation of touch surfaces.



**Game Transfer Phenomena (GTP)**

Video games (played on computer, console, phone, AR / VR headsets, etc.).

**Game controls/ keyboards**: vibrations, involuntary movements of fingers or sensation of touching gamepads  
**In-game content**: seeing images, hearing music, sound, voices, misperceiving stimuli, distortions of object, involuntary movements of limbs, sensations of whole body movement, recurrent thoughts.



**(New technologies, no studies found)**

Wearable devices e.g., smartwatches, vests, suites, gloves, wearable sub-woofers.

**Potential intrusions**: Tactile sensations e.g., vibration, touch, impact, textures, sensations of sound in body.

## Conclusions

- TIIMA is in the continuum between everyday phenomena and intrusions that cause distress and potential dysfunction.
- TIIMA appear harmless in most cases, especially those related to mobile phones.
- Challenges lie in that the intrusions can be interpreted as psychological or physical threats or that they can act as distractors for the task at hand (e.g., driving).
- New technologies such as wearable devices may provoke similar intrusions.
- The effects of interactive technology should be understood beyond the perspectives of impaired control (e.g., Gaming Disorder), considering the effects of the prolonged multi-sensory stimulation.