NGS NEWCASTLE GRAMMAR SCHOOL

Smartphones – Academic Friend or Foe? A Discussion Paper.

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ABSTRACT:
A brief literature review on the impact of smartphone ownership and usage on adolescent wellbeing and academic performance. Over 94% of Australian school-aged adolescents own a smartphone. This provides them with a world away from parents and teachers. Compulsive use, however, is associated with sleep disturbance, anxiety, depression, lowered self-esteem and lowered attention. Academic performance measured through ranking or GPA correlates negatively with increasing smartphone use. Heavy use correlates with reduction in the ability to delay gratification, low self-regulation and cognitive disruption. Adolescent students overestimate their ability to multi-task, thereby utilising smartphones while studying resulting in academic underperformance. While smartphones offer the potential of being a powerful learning tool, schools must carefully consider the best possible student outcomes when deciding policy.

UBIQUITY:

Smartphones are now ubiquitous amongst Australian school aged adolescents. The outcomes of a Morgan Poll published in August 2016 reported smartphone ownership amongst Australian teenagers at 94% (Griffiths & Williams, 2018). Communicating via mobile phone through messaging apps such as Snapchat, SMS or Instagram are the preferred method of communication for young people. They inhabit a text-based world away from parents and teachers. A 2017 British study found the median number of daily texts sent by teenagers to be 60, with a mean of 167 (Lister-Landman, Domoff, & Dubow, 2017). The universality of mobile phones and their adoption as the extension of the self amongst our young people (Clayton, Leshner, & Almond,

2015) has led to concerns regarding their impact on student wellbeing and academic progress, with one researcher claiming that "mobile phone-related distraction is the main reason for Australia's slide down the PISA rankings" (Griffiths & Williams, 2018, p. 2).

MENTAL HEALTH, ANXIETY AND DEPRESSIVE SYMPTOMS:

Smartphone addiction is a reality amongst today's teenagers. Nomophobia, a fear of separation from one's smartphone related to FoMO (Fear of Missing Out), is a recently recognised psychiatric disorder (Yildiz Durak, 2018) referring to "the pathological fear, anxiety or discomfort related to being out of touch with technology" (Clayton et al., 2015, p. 120). In their study of iPhone users, Clayton et al discussed the Extended Self theory that posits that an individual's possessions can become an extension of the self if we can control and exert power over them. Examples might be the knife of a Japanese fugu chef, the saxophone of a jazz musician or the hammer and chisel of a skilled cabinet maker. So, too, the iPhone can become an extension of an individual such that separation causes anxiety. In an experiment in which half the participants had access to their iPhone and half did not while performing a 'Word Search' activity, the researchers found that "inability to answer one's iPhone while it was ringing activated the aversive motivational system (increases in heart rate and unpleasantness) and also led to a decline in cognitive performance" (Clayton et al., 2015, p. 132). Rosen (2013) similarly finds that sending and receiving text messages is a source of emotional gratification, with the inability to check for text messages causing anxiety symptoms.

Users with low self-regulation requiring an external locus of control are at greater risk of smartphone compulsive behaviour. This compulsive behaviour leads to 'technostress' and mental health symptoms such as sleep disturbance, anxiety and depression (Lee, Chang, Lin, & Cheng, 2014). Higher rates of compulsive smartphone usage correlate with lower levels of self-esteem (Kim, Min, Ahn, An, & Lee, 2019), lowered attention and increased depressive symptoms (Seo, Park, Park, & Kim, 2016).

Amongst adolescents, it has been found that there is a direct link between procrastination and smartphone use, leading to lowered self-esteem. Procrastination mediates problematic smartphone use leading to lowered self-esteem (P. Wang & Lei, 2019). Further to this, recent research has found links between FoMO, procrastination, sensation seeking and adolescent

smartphone addiction, concluding that FoMO and procrastination lead to smartphone addiction and sensation seeking in adolescents (J. Wang et al., 2019).

ACADEMIC PERFORMANCE:

Humans are not neurologically wired to sustain focus for long periods of time. We need to take periodic breaks and disengage temporarily from tasks in order to recover our cognitive ability and optimise ongoing performance. Through their research into the use of using a smartphone in a study break, Kang and Kurtzberg (2019) found this results in the same level of cognitive depletion as would have occurred had there been no break at all. Just the presence of a mobile phone is enough to cause distraction as the user ponders what messages may be awaiting them. Furthermore, seeing a notification on a screen is as cognitively disruptive as going off task to check the message (Kang & Kurtzberg, 2019). In some cases, distraction can be caused even in the absence of a mobile phone. Phantom Vibration Syndrome is experienced by heavy users of smartphones. It is a mistaken sense that a message or notification has appeared on a user's mobile phone. The user might not have the phone on their person when experiencing Phantom Vibration Syndrome (Kang & Kurtzberg, 2019) but will experience the same level of cognitive disruption.

A study in American schools found that, on average, students spend fewer than 6 minutes studying before being distracted by texting and social media (Lister-Landman et al., 2017). The authors report a negative correlation between social media use and academic performance. Several studies report the negative correlation between increasing smartphone use and academic performance (Rosen et al., 2013; Wilmer & Chein, 2016; Wilmer, Sherman, & Chein, 2017; Yildiz Durak, 2018). Felisoni and Godoi, unsurprisingly, find that there exists a negative correlation between mobile phone usage during class time and academic rank but find also a similar negative correlation between mobile phone use in students' free time and academic ranking (Felisoni & Godoi, 2018). This is supported by Wilmer who finds that increasing engagement with mobile technology correlates with diminished self-regulation and impulse control (Wilmer & Chein, 2016). They have also found that the ubiquitous presence of mobile technology around young people corresponds with a stronger drive for instant gratification and a decreased

ability to delay gratification. Adolescence is a period of heightened reward sensitivity and is characterised by diminished impulse control in search of the dopamine surge that leads to serotonin-induced feelings of hedonic contentment (Blakemore, 2018; Duckworth & Steinberg, 2015; Gillespie, 2019; Rhyner, Uhl, & Terrance, 2018). Adolescents are at higher risk than young children and adults of addictive behaviours and addiction in general (Blakemore, 2018; Steinberg, 2014) and more likely also to participate in risky behaviour (Smith, Chein, & Steinberg, 2014; Smith, Rosenbaum, Botdorf, Steinberg, & Chein, 2018). The ubiquity and accessibility of smartphones provides opportunities for adolescents to satisfy their drive to take risks in search of the instant gratification driven by their heightened reward sensitivity (Gillespie, 2019). The mobile phone looks to be the 21st Century equivalent of Mischel's marshmallow (2014).

Adolescent students over-estimate their ability to multi-task (Felisoni & Godoi, 2018) which leads to underperformance academically. Several studies have found that students often report using smartphones while studying, doing homework or while in class. These studies find a negative correlation exists between multitasking involving smartphones and social media while studying and academic success (Lepp, Barkley, & Karpinski, 2015).

OVERVIEW – COGNITIVE FUNCTIONING:

In a review of 45 research projects exploring links between mobile technology habits and cognitive functioning, (Wilmer et al., 2017), the authors found:

- Attention:
    - Hearing a sound or feeling a vibration is sufficient to decrease ability to focus on a primary task; this leads to inferior performance.
    - The mere presence of a mobile phone is enough to affect cognitive functioning adversely.
    - Individuals scoring highest on measures of smartphone addiction also scored lowest on scores of self-regulated learning and experiences of 'Flow'.
    - There is a negative correlation between smartphone use and attention.
- Delay of Gratification and Reward Processing:

    - Heavy smartphone use correlates with a reduction in capacity for delayed gratification.
    - Receiving 'likes' on social media stimulates the brain's reward centres and leads to increased sharing of personal information with peers.
- Cognitive Functioning:
    - High levels of smartphone use predict poor academic performance as assessed by GPAs.
    - Low ability to self-regulate increases susceptibility to cognitive disruption, negatively impacting on academic success.
    - Smartphone use is shown to impact negatively on sleep quality which has significant negative impact on cognitive performance.
    - Social interactions on smartphones lead to heightened arousal and psychological stimulation, in turn leading to disrupted sleep patterns.

CONCLUSION:

Unsurprisingly, disparities exist between the perception of the benefits or otherwise of smartphones in the classroom between teachers and their students (Tossell, Kortum, Shepard, Rahmati, & Zhong, 2015). The smartphone is undoubtably "a device with the potential to enrich classes and expand knowledge" (Ariel & Elishar-Malka, 2019, p. 2338). It should be noted also that much of the literature currently exploring these issues relates to tertiary as well as secondary or primary aged students and many findings are correlational rather than causal, hence not all findings may be directly transferable to any given school. While smartphones are ubiquitous amongst teenage students and "can still be a very powerful tool that should be used to contribute to learning" (Felisoni & Godoi, 2018, p. 187), the current literature suggests caution and the need for educational institutions to develop well-considered and evidence-informed policy when considering how best to ensure the most positive outcomes for adolescent students.

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