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Longitudinal associations between changes in screen-time and mental health outcomes in adolescents

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ABSTRACT

Introduction: The primary aim was to examine longitudinal associations between changes in screen-time and mental health outcomes among adolescents.
Methods: Adolescents (N = 322, 65.5% females, mean age = 14.4 ± 0.6 years) reported screen-time and mental health at two time points over a school year. Multi-level linear regression analyses were conducted after adjusting for covariates.
Results: Changes in total recreational screen-time ($\beta = -0.09$ $p = 0.048$) and tablet/mobile phone use ($\beta = -0.18$, $p < 0.001$) were negatively associated with physical self-concept. Changes in total recreational screen-time ($\beta = -0.20$, $p = 0.001$) and computer use ($\beta = -0.23$, $p = 0.003$) were negatively associated with psychological well-being. A positive association was found with television/DVD use and psychological difficulties ($\beta = 0.16$, $p = 0.015$). No associations were found for non-recreational screen-time.
Conclusion: Changes in recreational screen-time were associated with changes in a range of mental health outcomes.

1. Introduction

The World Health Organization define mental health as a state of well-being and effective functioning in which an individual realizes their abilities, is resilient to stresses of life and is able to make a positive contribution to their community (Herrman, Saxena, & Moodie, 2005). Mental health problems (ill-being) are conditions that negatively affect an individual's mood, thinking and behavior (e.g., depression, anxiety, psychological difficulties and psychological distress) (Manderscheid et al., 2010). These disorders account for 45% of the global burden of disease among adolescents (Gore et al., 2011), affecting one in five young people (Asare, 2015). Despite their prevalence and burden to society, the underlying factors contributing to mental health problems among adolescents are poorly understood (Erskine et al., 2015). Given half of all cases of mental health problems develop by age 14 and remain untreated until adulthood (Erskine et al., 2015), there is an urgent need to identify modifiable determinants of mental health during adolescence. The period of adolescence marks a transition between primary to secondary school which may be particularly important.

Excessive screen-time has emerged as a behavior that may contribute to mental health (both well-being and ill-being) during adolescence (Hamer, Yates, Sherar, Clemes, & Shankar, 2016). The use of screens is often necessary for educational purposes, and some recreational screen-time (i.e., using television, DVD, computer, and tablet/mobile phone) may support young people's well-being (Houghton et al., 2015). However, time spent using screens for leisure has dramatically increased in recent decades (Houghton et al., 2015), and now typically exceeds what can be considered 'healthy' use. Indeed, the vast majority of adolescents (70–80%) exceed the recreational screen-time guidelines of less than 2 h per day (Hardy, 2013; Morley et al., 2012; Owens, Crone, Croix, Gidlow, & James, 2013).

With the availability and popularity of screen-based media increasing among youth, further work is needed to examine the effects of media engagement on mental health (Tremblay et al., 2011). Currently, few studies have explored associations between screen-time and the psychological antecedents of mental health

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(e.g., poor self-concept, aspects of wellbeing or psychological difficulties). Physical self-concept refers to the judgement of several aspects of one's physical self, i.e., appearance, strength, body fat and coordination (Marsh, Richards, Johnson, Roche, & Tremayne, 1994). Psychological well-being refers to the contentment with life and experiencing a richness of positive emotions (Straatmann, Oliveira, Rostila, & Lopes, 2016). Psychological difficulties refer to feelings of stress, loneliness, psychosocial feelings (Goodman, 1997). An improved understanding of the influence of screen-time on such psychological constructs is merited, principally as the majority of previous research has focused on indicators of mental ill-being (e.g., anxiety and depression).

Systematic reviews have concluded that excessive screen-time is negatively associated with well-being and positively associated with ill-being in young people (Costigan, Barnett, Plotnikoff, & Lubans, 2013; Tremblay et al., 2011). More specifically, studies have demonstrated that exposure to high levels of screen-time is negatively associated with physical self-concept (Suchert, Hanewinkel, & Isensee, 2016; Suchert, Hanewinkel, Isensee, & Group, 2015b) and psychological well-being (Muusses, Finkenauer, Kerkhof, & Billedo, 2014). While other studies have found screen use is positively associated with depression, anxiety (Cao et al., 2011; Kremer et al., 2014), psychological difficulties (Liu, Ming, Yi, Wang, & Yao, 2016; Parkes, Sweeting, Wight, & Henderson, 2013), and psychological distress (Booker, Skew, Kelly, & Sacker, 2015; Hamer, Stamatakis, & Mishra, 2009; Parkes et al., 2013) among adolescents.

The evidence for the influence of screen time on mental health in young people is building, but has been limited by a number of methodological shortcomings. For example, the majority of studies have been cross-sectional (Allen & Vella, 2015), involved the examination of only one screen medium (usually television) (Hamer et al., 2009), measured a narrow selection of mental health indicators (typically depression) (Kremer et al., 2014), and failed to statistically control for potential confounding variables (e.g., adiposity and physical activity) (Mathers et al., 2009; Rosen et al., 2014). Developing a more comprehensive understanding of the associations between screen-time and mental health outcomes in adolescents is a critical step toward addressing the high prevalence of mental health problems in this population.

The primary aim of the present study was to examine longitudinal associations between changes in screen-time (total and device specific) and multiple indicators of mental health (well-being and ill-being) among a sample of adolescents. We hypothesized that changes in recreational screen-time will be: (1) negatively associated with changes in physical self-concept and psychological well-being; and (2) positively associated with changes in psychological difficulties, after controlling for potential confounders. A secondary aim was to examine the association between non-recreational screen-time (i.e., for homework) and these mental health outcomes. We hypothesized that non-recreational screen-time would not be associated with mental health outcomes.

2. Methods

2.1. Participants

Data for the present investigation were drawn from the Switch-off 4 Healthy Minds study. A detailed description of the original study protocol and outcomes have been published previously (Babic et al., 2015, 2016). Ethics approval for the study was obtained from the Human Research Ethics Committees of the University of Newcastle, Newcastle-Maitland Catholic Schools Office and the Diocese of Broken Bay. Schools, parents and participants provided informed consent. Catholic secondary schools (N = 20) located in the Hunter region of New South Wales, Australia were invited to participate and the first eight schools to provide written consent were accepted. The study focused on students in the first year of secondary school (i.e., grade 7) who had recently transitioned from primary school. These students completed an eligibility questionnaire asking them to report their total time spent using screen devices on a typical school day. Students failing to meet national screen-time guidelines (i.e., > 2 h/day) were considered eligible and invited to participate. The first 40 students from each school to return signed consent letters were included. Time 1 (T1) data were collected at each school between April and June 2014 and Time 2 (T2) data (96% of the original sample) were collected between October and December 2014.

2.2. Measures

All assessments were conducted at schools by trained research assistants. Basic demographic information including: sex, country of birth, socio-economic status (SES) based on household postcode, and the number of children who speak English at home were collected (Table 1). Self-report measures were collected in exam-like conditions using an online survey with Apple iPads and physical measures were conducted discretely by a same-sex assessor.

2.3. Recreational screen-time

Screen-time was measured using the Adolescent Sedentary Activity Questionnaire (ASAQ) (Hardy, Booth, & Okely, 2007). The ASAQ required participants to self-report the time spent using a variety of screen devices on each day of the week, including weekends. Specifically, participants were asked to report time spent using various screen devices, which included: television,

Table 1
Characteristics of the study sample.

Characteristics	Total (N = 322)
Age, y, mean, SD [a]	14.40 ± 0.6
Born in Australia, n	322 (100%)
Sex, n	
Female	211 (66%)
Male	111 (34%)
English language spoken at home, n	316 (98%)
Cultural background, n	
Australian	316 (98%)
European	4 (2%)
African	0 (0%)
Asian	2 (0%)
Middle eastern	0 (0%)
Other	0 (0%)
Socioeconomic position, n [b]	
1–2	13 (4%)
3–4	84 (26%)
5–6	188 (58%)
7–8	25 (8%)
9–10	12 (4%)
Weight, kg, mean, SD [c]	51.49 ± 12.9
Height, cm, mean, SD [c]	156.98 ± 7.3
BMI, $kg.m^{-2}$ [d]	20.73 ± 4.2
Weight status, n	
Underweight	37 (12%)
Healthy weight	167 (52%)
Overweight	75 (23%)
Obese	43 (13%)

[a] Abbreviations: y = years, SD = standard deviation.
[b] Socioeconomic position determined by population decile using Socio-Economic Indexes For Areas of relative socioeconomic disadvantage based on residential postcode (1 = lowest, 10 = highest).
[c] Abbreviations: SD = standard deviation.
[d] Abbreviations: BMI = body mass index, SD = standard deviation.