"Phones off while school's on": Evaluating problematic phone use and the social, wellbeing, and academic effects of banning phones in schools

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ABSTRACT

Background and aims: Mobile phone bans in secondary schools are claimed to reduce student distraction and promote learning and face-to-face socializing. Currently, the evidence on phone bans is limited. The aim of this preregistered study was to evaluate the South Australian mobile phone ban's effects on students' problematic phone use, academic engagement, school belonging, and bullying. The study also sought to identify student variables that predict phone ban compliance. *Methods:* As the ban was phased in over 2023, a 2 (phone ban: yes/no) × 2 (time: baseline, 1-month follow-up) repeated-measures design was employed. Students ($n = 1,282$ at baseline; $n = 1,256$ at follow-up) in Grades 7 to 12 were recruited from five public secondary schools. Surveys included measures drawn from the Longitudinal Study of Australian Children (LSAC) and the Programme for International Student Assessment (PISA). *Results:* Problematic phone use was reported by 2.6% of the sample. Being older and a more frequent user of social media predicted lower phone ban compliance. Linear mixed models indicated that ban and no ban school groups did not differ significantly in terms of problematic phone use, academic engagement, and school belonging. There was slightly higher bullying in the ban group but bullying decreased significantly in both groups. *Discussion:* Imposing access restrictions may not affect the underlying psychological mechanisms that drive problematic phone use. Although these results indicate limited to no short-term benefits of the ban, further evaluation with more sensitive methodologies is recommended. *Conclusions:* Student-technology interactions in learning institutions should be continually monitored to determine the optimal balance to support student etiquette, learning, and wellbeing.

KEYWORDS

mobile phone, smartphone, ban, school, adolescent, problematic use

INTRODUCTION

There is growing international recognition of the negative psychological and physical health effects of excessive engagement in digital technologies, particularly among younger users (King & Delfabbro, 2019; Meng et al., 2022; Nikolopoulou & Gialamas, 2018; Salmon, Tremblay, Marshall, & Hume, 2011; Van Velthoven, Powell, & Powell, 2018; Wahi, Parkin, Beyene, Uleryk, & Birken, 2011). It has been conventional in the literature to conceptualize problematic smartphone use as falling under the same general category of behavioral addictions such as GD (Harris, Regan, Schueler, & Fields, 2020; Panova & Carbonell, 2018; Sahu, Gandhi, & Sharma, 2019; Sohn, Rees, Wildridge, Kalk, & Carter, 2019). Studies of problematic phone use have typically employed measurement approaches consistent with those used for gaming-related problems (Busch & McCarthy, 2021; Harris et al., 2020).

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Studies have highlighted negative consequences including interference with routine and basic self-care (i.e., sleep, eating, personal hygiene); less real-world social interaction (e.g., meeting friends); psychological distress (e.g., anxiety, depression), and disengagement from important responsibilities (i.e., school, work, family obligations) (Elhai, Dvorak, Levine, & Hall, 2017; Lopez-Fernandez, Honrubia-Serrano, Freixa-Blanxart, & Gibson, 2014; Sahu et al., 2019).

Recognizing the negative aspects of phone use, some major cities in the 2000s trialed a total restriction on phones in schools, including New York City in 2006 and Tokyo in 2009. More recently, bans have been introduced across Canada, France, Israel, Spain, and Sweden (Selwyn & Aargaad, 2021), and bans are anticipated in 2024 in Chile, Denmark, and England. In Australia, since 2020, phone bans have been progressively rolled out nationally. In November 2022, the South Australian (SA) Government announced a mandated policy to restrict phones in public secondary schools from Term 1 in 2023. Specifically, the policy requires students in all government schools to keep their personal devices, including mobile phones, off and away between the start and end of each school day and while attending authorized school activities off-site (https://www.education.sa.gov.au/mobile-phones). Other policy aims include reducing the negative impacts of inappropriate use of devices at school, including cyberbullying.

The first major phone ban study by Beland and Murphy (2014, 2016) involved analysis of data from 90 schools in the United Kingdom that had implemented a phone ban between the years 2006 and 2010. The authors reported an improvement in student academic performance among lower-achieving students following the ban, whereas the high achievers were neither positively nor negatively affected. Beland and Murphy estimated the impact of banning phones for low-achieving students was the equivalent of an additional hour a week in school or five additional school days a year. Kessel, Hardardottir, and Tyrefors (2020) attempted to replicate Beland and Murphy's study in their study of 1,086 schools in Sweden. In contrast to Beland and Murphy's study, Kessel et al. reported no improvement in student performance in schools with a phone ban. Taking into consideration the timing of the ban, urban versus non-urban school setting, and socioeconomic status did not affect the pattern of results. Notably, these studies did not examine any mental health factors as potential moderators; students with poorer mental health may be more reliant on phones as a means of coping (Duvenage et al., 2020; Modecki, Duvenage, Uink, Barber, & Donovan, 2022), and these students may therefore experience the ban differently.

Other potential benefits of bans have been investigated. Beneito and Vicente-Chirivella (2020) examined the effect of a phone ban on school performance and bullying in schools from two regions of Spain in 2015. The authors examined 2006–2018 data from the Programme for International Student Assessment (PISA) study, the worldwide study of students and educational systems. In relation to bullying, the researchers assessed officially reported cases of school bullying provided by the Spanish Ministry of Education between 2012 and 2017. Although the limitations of PISA data prevented conclusive findings, children's phone use was negatively associated with schools' academic results. Among students aged 12–17 years, there was a 15–18% reduction in bullying incidence following the ban, and a 10–18% reduction among 15- to 17-year-olds.

The present study

Little is known about the educational, mental health, and social effects of restricting phones for students. The literature is also limited in terms of whether individual characteristics (e.g., socio-economic status) influence the effect of bans. Research on phone bans has generally been conducted within the disciplines of economics and education, and have therefore lacked a psychological focus on student vulnerabilities. Wellbeing variables such as mental health and life satisfaction have not yet been considered in these models, but may contribute to potential effects of bans given the known relations between phone use and mental health (Elhai et al., 2017). It was rationalized that a general reduction in phone use may also reduce problematic phone use, based on intervention protocols which involve strategies to reduce habitual use, but this possibility requires investigation. Another research gap relates to whether students differ in terms of their compliance with phone use restrictions. Understanding this behavior provides valuable information on the efficacy and cost-effectiveness of measures used to implement the ban (e.g., using magnetic pouches, which cost schools many thousands of dollars). Studies have not examined the extent to which students actually comply with the bans and whether there are any predictors that underlie non-compliance. Examining ban compliance is also important for the integrity of a study examining the effects of a ban (i.e., it is a 'manipulation' check).

This project employed a controlled, pre-post natural experimental design to address two main research questions: (1) What are the characteristics of young people who comply with the phone ban? (2) Does the mobile phone ban have a positive effect on students' problematic use of mobile phones, academic engagement, school belonging, and bullying? The first question has not been examined in past studies and therefore required an exploratory approach. For the second research question, guided by past research and the expectations set forth in the SA Government's mobile phone ban policy, this study proposed the following hypotheses: (H1) The phone ban will have significant positive effects on: (a) problematic phone use, (b) academic engagement, (c) school belonging, and (d) bullying; and (H2) The effects of the phone ban will be moderated by socio-economic status, mental health, and life satisfaction, where the beneficial effects of the ban (i.e., decreased problematic phone use and bullying, and improved academic engagement and school belonging) will be greater for students with lower SES, poorer mental health, and lower life satisfaction.

METHOD

Design and procedure

This natural experiment employed a 2 (phone ban: yes/no) × 2 (time: baseline, follow-up) repeated-measures design, chosen to align with the Department for Education of South Australia (DECD) 2023 mobile phone policy. This policy was introduced in Term 1, 2023, with schools given the option to delay the ban until Term 3, 2023. The study involved surveying one group of schools ($n = 3$) at the end of Term 2 (June), 2023, and then in early Term 3 (August), 2023, after they had implemented the ban. This group of schools was referred to as the 'no ban' group (i.e., they had not yet implemented the ban at the time of the first survey). Another group of schools ($n = 2$) that had already implemented the ban (i.e., the 'ban' group) was surveyed concurrently. The study did not have any other inclusion criteria, but the research team did request the Department for Education to support the identification of schools from similar metropolitan regions with comparable student enrolments and socioeconomic zones. The protocol was preregistered in December 2023 (see: osf.io/pnjtk). The study procedures were carried out in accordance with the Declaration of Helsinki.

University ethical approval was obtained in April 2023 (ID: 5954) followed by DECD approval in May 2023. The Department's site engagement team provided a sample pool of 14 schools identified as suitable to participate, which included 6 schools that had not yet implemented the ban and 8 that already implemented the ban. Two schools that had already implemented the ban and one school that had not yet implemented the ban agreed to participate. Data collection was led by a postdoc (MR) and PhD candidate (CRG) who facilitated survey administration in schools during class hours and provided personalized reports to all participating schools at the conclusion of the study. Students gave informed consent or assent to participate; parents were informed of the study and gave passive consent (i.e., opt-out consent). Completed surveys were compiled and analyzed using SPSS for Windows (v29.0).

Measures

A full list of the project's measures, including all items and response categories, is provided on its preregistration page (https://osf.io/pnjtk/). Each participant provided socio-demographic information (e.g., date of birth, gender, residential postcode, school grade, language spoken at home, and mother and father's level of education). Technology-related questions included: (1) mobile phone ownership; (2) phone use at school; and (3) phone ban adherence. The phone ban adherence item for 'ban' schools was "How has your phone use changed since the mobile phone ban came into effect at your school?" (response options: (a) I am following the ban and not using my phone at school; (b) I am still using my phone or a spare phone at school occasionally; (c) I am still using my phone whenever I feel like it). Endorsing response

(a) was considered to indicate ban adherence, whereas the other two responses were considered non-adherence. Additional measures included:

Problematic phone use. Problematic phone use was assessed using the 'Growing Up in Australia: The Longitudinal Study of Australian Children' (LSAC) study measure of problematic social media use adapted to phone use. The LSAC is a major Australian study of more than 10,000 children and families that commenced in 2004 and collects data every two years. According to the LSAC Integrated Rationale Report (see: growingupinaustralia.gov.au), this measure was adapted from Andreassen et al. (2016). Item responses were: (1) Very rarely, (2) Rarely, (3) Sometimes, (4) Often, and (5) Very Often. 'Problem' phone use was indicated by: (1) at least 4 'Often' or 'Very Often' responses, and (2) endorsing the harm item ('I use my phone so much that it has a negative impact on work/study, mood, relationships). The internal consistency of the scale was $\omega = 0.84$ (T2: $\omega = 0.86$).

Academic engagement. Academic engagement was assessed by the LSAC 4-item measure (i.e., question EDUC_Q12). The LSAC guide explains that questions were drawn from the Household, Income and Labour Dynamics in Australia (HILDA) Survey, a major household-based panel study of more than 17,000 Australians that examines economic and personal wellbeing, labour market dynamics and family life (see: https://www.dss.gov.au/). This 4-item measure asked students to rate: (1) motivation to study; (2) ability to concentrate on studies; (3) level of achievement in their studies; and (4) level of stress related to their studies. All items are rated on a 5-point Likert scale including: (1) Very high, (2) High, (3) Average, (4) Low, and (5) Very low. Item responses were examined individually and summed to yield a continuous measure. The internal consistency of the 4-item measure was $\omega = 0.69$, which was considered not satisfactory. Therefore, the item on stress was removed, and the 3-item measure showed good internal consistency (Time 1 [T1]: $\omega = 0.83$; Time 2 [T2]: $\omega = 0.85$).

School belonging. School belonging was assessed by the Programme for International Student Assessment (PISA) study's 6-item measure. The PISA is a global study by the Organisation for Economic Co-operation and Development intended to evaluate educational systems by measuring student's scholastic performance on mathematics, science, and reading (see: oecd.org/pisa/aboutpisa/). Each item is a self-referential statement; for example, "I feel like an outsider (or left out of things) at school" and "I feel like I belong at school". Participants are asked to indicate their agreement with each item on a four-point Likert scale that includes "Strongly agree", "Agree", "Disagree", and "Strongly disagree". Higher scores indicated greater school belonging. The internal consistency of the scale was $\omega = 0.82$ across both timepoints.

Psychological distress. The Kessler Psychological Distress Scale (K10; Kessler et al., 2002) is a brief 10-question
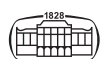
symptom scale designed to measure non-specific psycho-logical distress. The K-10 has been shown to be a valid measure of psychological distress in Australian contexts (Andrews & Slade, 2001; Bougie, Arim, Kohen, & Findlay, 2016). The K10 has utility for assessing psychological distress in health care and epidemiological research (Blake et al., 2023; Merson, Newby, Shires, Millard, & Mahoney, 2021; Smout, 2019). The K10 was scored using the Australian Bureau of Statistics categories (10–15 = low; 16–21 = moderate; 22–29 = high; 30–50 = very high). The internal consistency of the scale was $\omega = 0.90$ (T2: $\omega = 0.92$).

Life satisfaction. Life satisfaction was assessed by the PISA study's 3-item measure of life satisfaction, which includes direct references to life purpose or meaning. Three items are self-referential statements, including "My life has clear meaning or purpose" and "I have a clear sense of what gives meaning to my life". Participants indicate agreement on a 4-point scale from "Strongly disagree" to "Strongly agree". Higher scores indicate stronger agreement. The internal consistency of the scale was $\omega = 0.90$ (T2: $\omega = 0.93$).

Bullying. School bullying was assessed by the PISA study's 7-item measure of school bullying, which captures verbal, physical, relational, and extortion bullying. There are six items containing a self-referential statement; for example, "Other students made fun of me" and "I got hit or pushed around by other students". Participants are asked to indicate the frequency of each bullying incident on a scale of "Never", "A few times a year", "A few times a month", and "Once a week or more". An item asks if bullying had occurred online, offline, or combination of both. Following the 2022 PISA scoring approach, scores on each statement are combined into a single index of bullying exposure. The internal consistency of the scale was $\omega = 0.85$ (T2: $\omega = 0.89$).

Socio-Economic Status. Socio-economic status was determined by students' residential postcode location according to the 2021 Index of Relative Socioeconomic Disadvantage (IRSD) Socioeconomic Indexes for Areas (SEIFA) in Australia. SEIFA scores are standardized to a distribution with $M = 1,000$ and $SD = 100$ (our sample, $M = 1,010$, $SD = 128.7$). SEIFA scores were categorized using the Australian Bureau of Statistics (2021) quintiles with the first and fifth quintile representing the most and least disadvantaged, respectively.

Social media posting frequency. Social media posting frequency was measured by a single item: "How often do you share/post on social media?". The single item was assessed on an 8-point Likert scale ranging from "Never/I don't have any social media accounts" to "hourly or more often".

Data analysis and modelling

Independent t-tests examined potential baseline differences between groups. Ideally, groups should be comparable on variables of interest to detect change over time due to the manipulation (i.e., intervention) despite the absence of randomization. Linear Mixed Models (LMM) was employed for repeated measures analyses, preferable to ANOVA because it can account for a hierarchical structure in the data, retains all cases irrespective of missing data and adjusts for correlated data. Our models included a random effect for participants (i.e. to avoid the assumption that the repeated observations from the same participants were independent of each other), and a random effect for schools to account for clustering effects due to participants being students nested within schools. In the LMM analyses, the fixed factors were condition, time, and the interaction between condition and time. Thus, we created 2 (phone ban: ban, no ban) $\times$ 2 (time: baseline, follow-up) mixed effects models for each outcome variable. We also conducted linear mixed models to test whether psychological distress, life satisfaction, and socio-economic status would moderate the effect of the phone ban on our dependent variables. In addition, logistic regression examined the predictors of mobile phone ban compliance.

Ethics

University ethical approval was obtained in April 2023 (ID: 5954) followed by DECD approval in May 2023. Students gave informed consent or assent to participate; parents were informed of the study and gave passive consent (i.e., opt-out consent).

RESULTS

Descriptive analyses

Table 1 presents a summary of the sample's characteristics across survey waves. A total of 1,282 students returned the baseline survey, and 1,256 students returned the second survey (NB: 1,338 students returned at least one survey and 597 students returned both surveys). Mobile phone ban adherence (87%) was based only on the ban group responses because the no ban group did not have a ban in place until follow-up. Supplementary material provides complete descriptive statistics and zero-order bivariate correlations between dependent variables.

Baseline comparisons: Ban vs no ban group

Table 2 presents the results of the baseline between-groups analyses between the ban and no ban groups. Contrary to predictions, the no ban condition reported significantly greater academic engagement and lower bullying than the baseline phone ban condition, but the effect was small. The ban condition and no ban condition did not significantly differ in terms of gender proportions, $\chi2(2, N = 1,225) = 1.62$, $p = 0.45$, $\Phi = 0.04$. However, the no ban condition had significantly more language other than English speakers at home than the ban condition, $\chi2(1, N = 1,272) = 45.5$, $p < 0.001$, $\Phi = 0.19$. The no ban condition ($M = 14.9$, $SD = 1.79$) was also significantly older than the baseline

Table 1. Demographics, mobile phone usage, social media usage, and psychological distress

	Baseline (Total N = 1,282)		Follow-up (Total N = 1,256)	
	N	% Reported sample	N	% reported sample
Gender				
Male	582	45.7	630	50.6
Female	642	50.4	590	47.4
Non-binary/other	49	3.8	26	2.0
Grade				
Junior (7–9)	894	70.2	820	65.9
Senior (10–12)	378	29.7	426	34.1
Phone ownership and pre-ban usage				
Mobile phone ownership	1,203	96.2	1,187	95.5
No use at school	523	51.9	294	52.3
Use during class breaks	409	40.6	232	41.3
Use during class and breaks	76	7.5	36	6.4
Problem use and ban adherence				
Problem phone users	31	2.6	36	3.1
Mobile phone ban adherence	579	87.1	937	79.9
Social media posting frequency				
Daily	235	18.9	173	14.1
Weekly	235	18.9	229	18.6
Monthly or less	417	33.6	434	35.4
Never	353	28.4	392	31.9
Psychological distress				
Low	236	19.9	293	24.9
Moderate	354	29.8	352	29.9
High	279	23.5	266	22.5
Very High	319	26.8	267	22.7
Bullying (During past 12 months)				
No experienced bullying	700	61.5%	701	63.1%
Only online bullying	36	3.2%	41	3.7%
Only offline bullying	228	20.0%	194	17.5%
Both online and offline bullying	175	15.4%	175	15.8%

ban condition (M = 14.1, SD = 1.65), t(1,271) = 7.26, $p < 0.001$, d = 0.47. Groups did not differ on problematic phone use or school belonging. These minor differences between schools did not affect the pattern of results presented subsequently.

Repeated measures analyses

Table 3 presents the estimated marginal means, standard errors, and inferential statistics (i.e., *F*, *df*, and *p* values) for condition, time, and condition × time interaction. Unstandardized coefficients are reported in the supplementary material. There was no significant main effect of condition or a condition × time interaction on problematic phone use. Therefore, Hypothesis 1a was not supported. However, there was a significant main effect of time for problematic phone use indicating that, collapsed across condition, problematic phone use decreased over time, d = 0.30, 95% CI [0.22, 0.39]. There was no significant main effect of condition on academic engagement, but there was a significant interaction between condition and time. As shown in Fig. 1, academic engagement increased over time for the ban group, d = 0.28, 95% CI [0.17, 0.39], but did not significantly change in the no ban group, d = 0.09, 95% CI [−0.04, 0.21]. However, there was no significant between-group difference in academic engagement at follow-up, d = 0.03, 95% CI [−0.14, 0.20]. Therefore, Hypothesis 1b was not supported.

In terms of bullying, there was a significant main effect of condition on bullying, indicating that, collapsed over time, the ban group had higher bullying than the no ban condition, d = 0.14, 95% CI [0.06, 0.22]. There was also a significant main effect of time for bullying, indicating that, collapsed across condition, bullying decreased over time, d = 0.33, 95% CI [0.25, 0.41], but there was no significant interaction between condition and time. Therefore, Hypothesis 1c was not supported. There was no significant main effect of condition or time or a condition × time interaction on school belonging; therefore, Hypothesis 1d was not supported.

Moderation analyses

Moderation analyses examined whether baseline life satisfaction, psychological distress, and socio-economic status would moderate the effect of the phone ban on our dependent variables. Baseline life satisfaction and psychological distress had significant main effects on all dependent variables. However, there were no significant three-way interactions between condition, time, and moderator for any dependent variable. Therefore, Hypothesis 2 was not supported. Supplementary material provides a summary of the moderation analyses. Notably, these analyses showed that there were no significant main effects of condition or
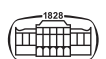
Table 2. Comparisons of ban and no ban groups at baseline

	Condition				
Variable	No baseline phone ban M (SD)	Baseline phone ban M (SD)	(df), t	p	d [95% CI]
1. Problematic phone use	2.38 (0.86)	2.39 (0.89)	(1,173), −0.11	= 0.912	0.01 [−0.12, 0.11]
2. Academic engagement	**3.08 (0.74)**	**2.94 (0.71)**	**(1,155), 3.46**	**= 0.002**	**0.18 [0.07, 0.30]**
3. School belonging	2.93 (0.54)	2.87 (0.57)	(1,155), 1.72	= 0.087	0.10 [−0.15, 0.22]
4. Bullying	**1.42 (0.54)**	**1.51 (0.61)**	**(1,137), −2.46**	**= 0.014**	**0.15 [0.03, 0.26]**

Notes. M = mean, SD = standard deviation, *d* = Cohen's effect size. Significant between group differences are bolded.

Table 3. Estimated marginal means and standard errors for main effects and interactions

Dependent variable	Baseline		Follow-up		Condition	Time	Condition × time
	Baseline ban M (SE)	No baseline ban M (SE)	Baseline ban M (SE)	No baseline ban M (SE)			
Problematic phone use	2.39 (0.03)	2.38 (0.04)	2.24 (0.04)	2.23 (0.05)	$F(1, 1,350) = 0.33$ $p = 0.855$	$F(1, 646) = 26.4$ $p < 0.001$	$F(1, 646) = 0.01$ $p = 0.920$
Academic engagement	2.94 (0.03)	3.08 (0.03)	3.06 (0.04)	3.04 (0.04)	$F(1, 1,333) = 1.87$ $p = 0.172$	$F(1, 608) = 3.26$ $p = 0.071$	$F(1, 608) = 9.75$ $p = 0.002$
School belonging	2.87 (0.02)	2.92 (0.03)	2.90 (0.03)	2.93 (0.03)	$F(1, 1,352) = 1.47$ $p = 0.226$	$F(1, 643) = 0.60$ $p = 0.439$	$F(1, 643) = 0.18$ $p = 0.675$
Bullying	1.51 (0.02)	1.43 (0.03)	1.36 (0.03)	1.28 (0.04)	$F(1, 1,308) = 5.48$ $p = 0.019$	$F(1, 603) = 53.0$ $p < 0.001$	$F(1, 603) = 0.35$ $p = 0.851$

Note: Significant fixed effects are bolded. Effect sizes for significant effects are reported in text.
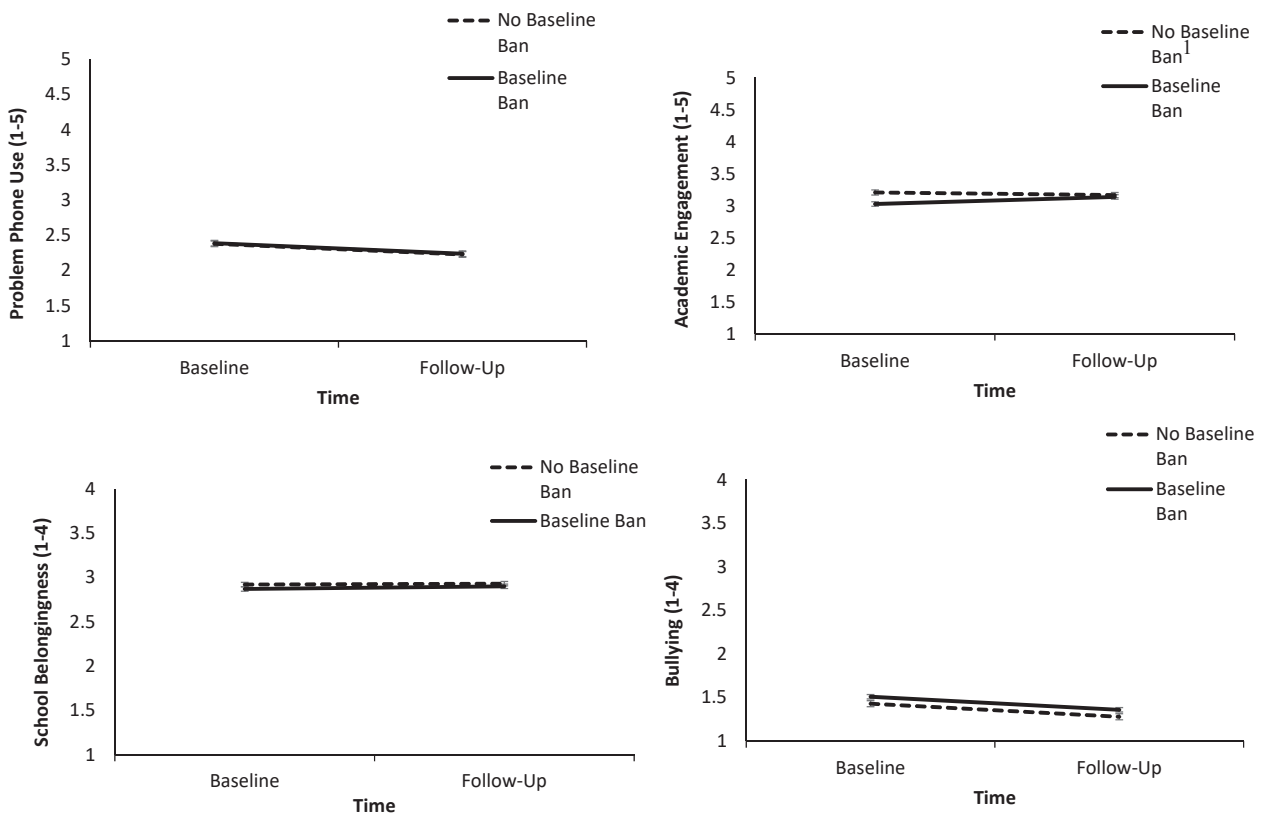

Fig. 1. Change in key outcome variables across time by group (ban vs no ban) with standard error bars

condition × time interactions on psychological distress and life satisfaction.

Predictors of phone ban compliance

Overall, 87% of participants reported that they were compliant with the phone ban. An exploratory logistic regression evaluated the predictive relationships of age, gender (male/female), social media posting frequency, and pre-ban mobile phone use at school (no/yes) on ban compliance. Table 4 presents the results for Time 1 (ban group only) and Time 2 (both groups). At Time 1, age, social media posting frequency, and pre-ban mobile phone use at school were significant negative predictors of phone ban

compliance. At Time 2, age, social media posting frequency, pre-ban mobile phone use at school, and bullying were significant negative predictors of mobile phone ban adherence. Being older, a more frequent user of social media, using phone at school before the ban, and experiencing bullying, were associated with phone ban non-compliance.

DISCUSSION

This study contributes the first Australian data on the potential effects of banning mobile phones in secondary schools on academic and wellbeing variables. Overall, the

Table 4. Logistic regression of demographics, social media posting frequency, and pre-ban mobile phone use predicting phone ban compliance

|	B	SE	Wald	p	Odds ratio	95% CI Lower	95% CI Upper
Time 1 mobile phone ban adherence	$R^2 = 0.07$ (Cox-Snell), 0.14 (Nagelkerke). Model χ^2 (11) $= 44.4$, $p < 0.001$						
Constant	7.73	2.10					
Age	**−0.22**	**0.09**	**6.49**	**0.011**	**0.80**	**0.68**	**0.95**
Gender (Male/Female)	0.09	0.30	0.10	0.752	1.10	0.62	1.96
Social media posting frequency	**−0.18**	**0.06**	**8.33**	**0.004**	**0.83**	**0.74**	**0.94**
Pre-ban mobile phone use at school (No/Yes)	**−0.83**	**0.29**	**8.23**	**0.004**	**0.44**	**0.25**	**0.77**
Socio-economic status	0.01	0.01	0.08	0.779	1.00	1.00	1.00
Psychological distress	−0.01	0.02	0.28	0.594	0.99	0.95	1.03
Life satisfaction	−0.27	0.25	1.14	0.285	0.77	0.47	1.25
Problem phone use	−0.30	0.17	2.97	0.085	0.74	0.53	1.04
Academic engagement	0.14	0.17	0.62	0.432	1.15	0.82	1.61
School belonging	0.01	0.31	0.01	1.00	1.00	0.54	1.85
Bullying	−0.29	0.25	1.36	0.244	0.75	0.46	1.22
	B	SE	Wald	p	Odds ratio	95% CI Lower	95% CI Upper
Time 2 mobile phone ban adherence	$R^2 = 0.26$ (Cox-Snell), 0.44 (Nagelkerke). Model χ^2 (11) $= 151.3$, $p < 0.001$						
Constant	15.1	2.74					
Age T2	**−0.74**	**0.11**	**47.5**	**<0.001**	**0.48**	**0.39**	**0.59**
Gender (Male/Female) T2	−0.38	0.34	1.28	0.257	0.68	0.35	1.32
Social media posting frequency T2	**−0.17**	**0.08**	**4.95**	**0.026**	**0.84**	**0.72**	**0.98**
Pre-ban mobile phone use at school (No/Yes) T2	**−2.13**	**0.38**	**30.8**	**<0.001**	**0.12**	**0.06**	**0.25**
Socio-economic status T2	0.01	0.01	0.01	0.962	1.00	0.99	1.01
Psychological distress T2	0.01	0.02	0.20	0.654	1.01	0.96	1.06
Life satisfaction T2	0.40	0.23	3.03	0.082	1.49	0.95	2.35
Problem phone use T2	−0.40	0.21	3.54	0.060	0.67	0.44	1.02
Academic engagement T2	0.33	0.19	2.86	0.091	1.39	0.95	2.03
School belonging T2	−0.29	0.35	0.68	0.411	0.75	0.38	1.49
Bullying T2	**−0.81**	**0.29**	**7.85**	**0.005**	**0.44**	**0.25**	**0.78**

Note: Time 1 includes only ban group data. Bold text indicates significance level of $p < 0.05$.

results indicated that the ban and no ban schools either did not differ significantly, or there were minimal differences, in terms of problematic use of mobile phones, academic engagement, school belonging, and bullying. There was a small decline in bullying and problematic phone use over time in both school groups regardless of phone ban, suggesting the phone ban may not necessarily underlie these changes. The moderation analyses did not identify the hypothesized interacting effects of life satisfaction or psychological distress on the effect of the phone ban on outcome variables. Therefore, in broad terms, the present study did not detect evidence of the desired, or any undesired, effects of the phone ban over a short period of time.

These results contribute to a small but mixed empirical literature on mobile phone ban policies (Beland & Murphy, 2014, 2016; Beneito & Vicente-Chirivella, 2022; Kessel et al., 2020). Although studies are not entirely consistent, the emerging research picture is that mobile phone bans appear to have either no detectable effects or relatively subtle effects detected only in certain subgroups over longer periods of time (e.g., increased academic performance among lower achievers). In evaluating this research base, it is important to recognize the many differences in study context, methodology, and the nature of the mobile phone ban itself, which complicate the synthesis of available data. Acknowledging this caveat, the present study's results appeared to align with Kessel et al.'s (2020) study which reported very limited effects of the mobile phone ban across its main outcome variables.

The reported frequency of problematic phone use was 2.6%. Problematic phone use was measured in line with the DSM-5-TR and ICD-11 clinical descriptions of gaming disorder. Notably, this figure was consistent with meta-analyses on gaming disorder prevalence, which falls between 2 and 3% (Stevens, Dorstyn, Delfabbro, & King, 2021) but was lower than other estimates of problematic phone use exceeding 5% (e.g., Sahu et al., 2019; Sohn et al., 2019). The mobile phone ban policy was primarily focused on promoting students' engagement with education, but the ban did not appear to have any (short-term) effect on problematic phone use. The lack of an effect may have been due to: students having access to other digital devices;
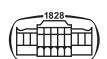
the restriction period being too brief to properly challenge students' use of phones; limited 'fear of missing out' effects given that peers were also without phones, and/or; the ban during school hours simply increased anticipation and reward salience associated with phones rather than lowering overall 'dose' and 'interference' related to phone use. These results add to the limited data on restriction and abstinence effects associated with digital technology habits (Brailovskaia et al., 2023; Evans, King, & Delfabbro, 2018; Pawlowski, Nielsen, & Schmidt, 2021).

Of principal interest to policymakers is the effect of banning phones on students' academic performance. The present study differed from Beland and Murphy's (2016) and Kessel et al.'s (2020) studies by employing a multi-faceted measure of academic performance. Whereas their studies evaluated students' actual results on 'high stakes' tests (Beland & Murphy, 2016) and national standardized tests (Kessel et al., 2020), the present study evaluated student in-classroom performance in terms of self-reported 'academic engagement'. The academic engagement measure included students' perceived motivation and concentration, as well as level of achievement in their studies, which was rationalized to better capture the proposed 'distracting' effects of mobile phones in the classroom. The results indicated that the ban and no ban groups had minimal differences on these outcomes, which may indicate that phones had only a limited distracting effect on students or, perhaps, that distracted students tend to identify alternative distracting stimuli in the absence of mobile phones. Students' continued access to other devices with similar functionalities to phones (e.g., laptops, tablets) in the classroom may have diminished the effects of removing phones specifically.

The phone ban policy in South Australia requires all students' phones to be stored away in a bag or locker during school hours. Schools employed the Yondr© pouch, a magnetically locked bag, for restricting phone access. With this technology in place, there seems to be few ways that students could still access a phone, such as having a concealed phone or somehow opening the pouch (e.g., using force). The present study found that most students (87%) reportedly complied with the ban; however, it is unclear how or why some students did not comply. Being older and a more frequent user of social media were associated with phone ban non-compliance. Older students may be more accustomed than younger students to having unrestricted access to their phone and take longer to adjust to the change in restrictions. Students with stronger habits or urges to check social media (e.g., due to fear of missing out, intolerance of uncertainty; Rozgonjuk et al., 2019) may be compelled to use their phone, assuming that they cannot access these phone functionalities via other permitted devices.

Stakeholders in secondary education have debated the value of a phone ban against various standards of research evidence and/or cost-benefit analysis (Campbell & Third, 2020). Considering such standards, the presented findings may be viewed as failing to identify clear advantages of the ban. However, by the same token, no downsides of the ban

were identified in this study. Some may conclude, then, that it is premature to introduce such bans in schools or similar contexts (Campbell & Third, 2020). However, there is the view that phone ban policies should not be evaluated primarily in terms of immediate evidence of 'bang for buck' or other indictors of effectiveness. This may be impractical, particularly if applied to gatekeeping policies, as it may take years to obtain sufficient evidence, by which time new challenges associated with digital technologies have emerged. The phone ban should be evaluated, then, according to the principles its makers sought to promote, such as 'respect' and 'responsibility'. To evaluate the phone ban requires accounting for whether the phone ban functions as an effective symbolic gesture or cultural practice – one that conveys that school communities, and society in general, places special value or importance on the intentional removal of phones in certain situations or contexts.

The present study had several limitations. First, the results were based on students' self-report, which may be affected by various biases and errors in reporting. Only students completed the survey measures; the study lacked access to objective data (e.g., academic grades, bullying incident reports) and an external rater to compare with the student perspectives. Teachers may be more objective in reporting students' concentration and motivation to study and monitoring changes over time (Thomas, O'Bannon, & Bolton, 2013). Another limitation was the two-wave longitudinal design, which was considered most feasible given the significant challenges in conducting research in schools within a limited time frame. The design provided only a 'snapshot' of before and after the ban. An experience sampling method may have provided a more sensitive measurement approach, but this may have been more disruptive to schools and prone to attrition, as well as difficult to implement without phone access. Similarly, the study focused on problematic phone use and not on specific applications (e.g., social media). This study also lacked detailed measurement of students' social dynamics (e.g., face-to-face communication), mobile phone use (e.g., minutes per day, interaction with apps) and objective school achievement (e.g., grades). Finally, this study did not employ a fully randomized school selection and sample allocation protocol; therefore, the study sample should not be considered representative.

CONCLUSIONS

Many schools face challenges in regulating students' personal device use to ensure that such use is healthy, aligns with school values, and supports learning and social development. Although schools have embraced digital education initiatives (Tingir, Cavlazoglu, Caliskan, Koklu, & Intepe-Tingir, 2017), the rollout of mobile phone bans internationally suggests that education systems also view unrestricted phone access as a hindrance to cultivating student etiquette, socialization, and learning. The present study employed a longitudinal survey design to evaluate the mobile phone ban in the South Australian context. The ban and

no ban school groups did not differ significantly in terms of problematic use of mobile phones, academic engagement, school belonging, and bullying. Although these findings may indicate that the ban had limited to no short-term benefits, we caution that these findings should be considered preliminary and other methods of evaluation should be employed in future studies. Future research should employ, where feasible, more rigorous designs that include larger and more representative samples, and more comparison groups (e.g., a control condition with no ban implemented). There is a continual need to critically evaluate the effects of human-computer interactions in learning institutions, particularly involving children and adolescents, to better understand the optimal conditions that support wellbeing and learning.

SUPPLEMENTARY MATERIALS

Supplementary data to this article can be found online at https://doi.org/10.1556/2006.2024.00058.

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