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Problematic Smartphone Use Among High School Students

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ABSTRACT

The world currently has more than three billion smartphone users. The smartphone is fully integrated into the daily life of individuals, including 95% of American teenagers. Excessive use of the smartphone leads to smartphone addiction and problematic smartphone use (PSU) which has been associated with depression, stress, reduced self-esteem, and decreased academic performance. This PSU study surveyed high school students grades nine thru twelve from a comprehensive and demographically diverse high school in the United States. This study was conducted with 319 high school students to assess for associations among PSU, depression, stress, self-esteem, grit, and academic performance. Results of this study indicated that students use the smartphone to support learning both inside and outside of the classroom. Results also indicated significant correlations among PSU, depression, stress, self-esteem, grit, and academic performance. Multiple regression analysis found stress, self-esteem, and grit to be significant predictors of PSU. Implications of this study included informing families, educators, district administrators, and policymakers to more fully and rigorously utilize the electronic device policy provided in California Assembly Bill 272 and to implement more robust and thoughtful classroom smartphone policies and practices. Recommendations are to continue to assess and build awareness of PSU among adolescents, especially post COVID-19 pandemic, when interpersonal relationships and personal connections are a focus of social emotional pandemic recovery.

***Keywords*:** problematic smartphone use, depression, stress, self-esteem, grit, academic performance, high school students

Currently, the world has three billion smartphone users, with anticipated growth in the hundreds of millions (O'Dea, 2020). Smartphone technology is part of daily life for many individuals including 95% of American teenagers (Anderson & Jiang, 2018; Vogels, 2019). When device usage becomes excessive, and the user overly dependent on the device, a behavioral addiction, problematic smartphone usage (PSU) can develop with symptoms that mirror substance addiction (Billieux et al., 2015). These behavioral addictions impair the function of social-emotional health, daily living, personal productivity, and professional and academic performance (Demírcí et al., 2015; Elhai et al., 2019; Fischer-Grote et al., 2019).

Teenage users, when compared to users of other age groups, are most vulnerable to PSU (Kwon, Kim, et al., 2013). Negative outcomes of PSU overflow into the home and classroom, especially secondary and post-secondary classrooms, causing distractibility, interruption of the cognitive process, and isolating students from building interpersonal relationships with teachers and peers (Baert et al., 2020; Balhara et al., 2018; Cha & Seo, 2018). Consequently, the smartphone device increases depression and perceived stress, lowers self-esteem, and decreases academic performance (Coskun & Muslu, 2019; Rubin & Peltier, 2018). However, contrary to PSU, smartphone devices can also provide beneficial functions including safety, communication, social connectivity, personal organization, and relief from loneliness, boredom, stress, and depression (Hawi & Samaha, 2016).

Problematic Smartphone Use (PSU)

Mobile phone addiction and PSU have been researched for two decades (Bianchi & Phillips, 2005). Studies focusing on the negative outcomes of PSU have rapidly increased within the past 10 years and indicate negative outcomes of stress, depression, low self-esteem, and decreased student academic performance (Do et al., 2020; Kwok et al., 2017).

Teenagers born in the year 2000 and later are Generation Z digital natives, who accept, embrace, and expect the smartphone to be part of their social development, identity, and a normative method of communication. Teenagers are the most vulnerable user group to PSU because of their impressionability at this developmental stage of adolescence (Kwon, Kim, et al., 2013). In addition, teenagers have high neuroplasticity and rapid learning ability (Kwon, Kim, et al., 2013; Turkle, 2011). Teenagers willingly and enthusiastically accept new media. Research concludes the highest rate of PSU is seen in teen social media usage, second is teen digital gaming (Kwon, Lee, et al., 2013).

The balance of using the smartphone device as a tool versus a behavioral addiction can depend on the user's age and self-regulation (Diehl et al., 2006). The smartphone does not discriminate between age and gender; however, adolescents and teenagers have a tendency to develop more habitual usage problems than adults due to their high interest and adaptability to novel technologies, peer collaboration, and high amounts of unsupervised time (Kwon, Kim, et al., 2013).

In their physical reality, conversations and relationships can be exhausting and cause nervousness for teenagers. In the smartphone digital reality, the user can engage with others and acquire information in a quiet, secluded, private digital space, selectively interacting with others at a controlled level, often without pressure. This controlled digital space offers time and strategic opportunity to communicate, which can be difficult for teenagers to navigate in person (Lee et al., 2018; Turkle, 2011).

PSU becomes a behavioral addiction when the power balance changes from the user controlling the device, to the device controlling the user. Intuitive smartphone programming creates a reality of complete personal preference and gratification for the user (Orlowski, 2020; Turkle, 2016). The smartphone virtual world then empowers the user to control and pre-construct digital communication. This manufactured, unauthentic, virtual reality creates an image of who the user wants to be, rather than is, by creating profiles and portraits of their personal fantasy image (Orlowski, 2020; Turkle, 2011). Conversation can be crafted and controlled rather than crafted in the moment with the evolving skill of reciprocal communication.

Stress, Depression, Self-Esteem, and Grit

Interpersonal relationships are social connections, personal associations, and interactions among two or more people (Aagaard, 2019). This interconnected verbal and non-verbal communication is a foundation for building relationships among individuals of all ages, especially teenagers in middle school and high school who value interpersonal friendships for peer identification and support. PSU places stress on interpersonal relationships with negative anti-social behaviors including *phubbing*, being on your phone and excluding the person in your physical presence, *fear of missing out* (FoMO), the fixation on the events of others as seen through digital communication or social media, while being physically present with others, and *nomophobia*, the anxiety caused by not being able to use one's mobile phone (Chotpitayasunondh & Douglas, 2016; Stockdale et al., 2018; Vanden Abeele et al., 2016; Wang et al. 2017). PSU also increases physical and mental stress due to sleep disruption and physical body pain (Demírcí et al., 2015; Do et al., 2020). Users experience an increase in eye strain, back and joint pain, hypertension, and obesity due to the lack of mobility caused by excessive hours scrolling social media, playing video games, and binge-watching entertainment on the smartphone (Kwok et al., 2017).

Alhassan et al. (2018) reported depression being a mood disorder highly correlated with PSU. Fisher-Grote et al. (2019) summarized 38 global studies reporting PSU among teens engaged in internet surfing, gaming, social media, and multi-media messaging, having depression when the digital stimulation was removed. Research by Horvath et al. (2020) is the first study using magnetic resonance imaging (MRI) technology for brain imaging to observe the change in brain grey matter activity between a group of individuals identified with PSU and a control group of lesser PSU smartphone users. Horvath et al.'s (2020) results are the first to demonstrate distinct structural and functional correlations among the brain of PSU to that of behavioral addictions. The study recommends further testing and confirms depression and additional harmful outcomes of PSU.

Rosenberg (1965) refers to self-esteem as the mental representation of one's self regarding overall feelings of self-worth and self-acceptance. Wang et al. (2017) research on self-esteem as a predictor of PSU using the Smartphone Addiction Scale (SAS) found students with high self-esteem reported less likelihood to display PSU. Li et al. (2019) also found self-esteem was a predictor of PSU and students with lower self-esteem had higher PSU.

Grit is a non-cognitive personality trait defined as perseverance and passion for long-term goals (Duckworth, 2016). Grit has two components, passion and perseverance blended with consistency over time and staying focused on consistent goals. Grit can be developed within individuals through the utilization of effort and skill. Effort builds personal talent into skill, and skill into productivity (Duckworth et al., 2007). Grit emphasizes effort. Without effort, Duckworth et al. (2007) states that talent is unmet potential. Without effort, skill is nothing more than what an individual would have done but did not complete (Duckworth, 2016; Duckworth & Quinn, 2009).

Smartphone Regulations

Global attention focused on PSU in 2014, when the World Health Organization hosted a meeting to address the behavioral addiction of PSU and the growing PSU global public concern (Billieux et al., 2015). India, the second highest nation of internet users in the world, addressed the issue of teenage PSU with a preventative program sponsored by the South East District New Delhi Police. Balhara et al. (2018) reported the New Delhi Police launching a program of cyber awareness directed toward teenagers in middle school, high school, and colleges to address PSU as a behavioral addiction. The preventative program focused on the awareness of PSU, internet addiction, and safe practices for the internet.

Additional countries outside the United States currently implement policy for smartphone removal, or ban, in primary and secondary schools. In England in 2013, local authorities in four districts banned the smartphone from secondary high schools. The research of Beland and Murphy (2015) reported a significant increase in standardized test scores among students after the smartphone ban, especially among at-risk students and students from low-income households.

In the fall semester of 2018, France banned smartphone use in first through ninth grades, with results indicating an increase in interpersonal relationships among students, teachers, and peers, and reports of a more positive campus culture. French students reported decreased stress, less depression, and improved positive interactions with peers, following smartphone removal (Rubin & Peltier, 2018).

The United States is slow to implement smartphone removal policy in schools (Klein, 2019). Multiple states, including Arizona, Maine, Maryland, and Utah, attempted to write and pass legislative policy to limit smartphone use in schools; however, the mentioned states continually lost the legislative vote needed to pass policy (Klein, 2019).

The California Department of Education established an electronic management policy in 2003, Education Code § 48901.5, permitting the governing board to regulate the use of electronic devices while students are on campus; however, electronic devices in 2003 were minimal in design and capability compared to current smartphone devices. Revision to the education code was approved in 2019 as California Education Code § 48901.7. Assembly Bill A.B. 272 directly limits or prohibits the use of smartphones among students while on campus, with detailed student exceptions (Education Code § 48901.7).

The San Mateo Union High School District and Palos Verdes Unified School District in California as well as the Crestwood Unified District in Ohio, passed educational policy to ban smartphones from district campuses throughout the entire day (Klein, 2019). The removal of smartphone devices from classrooms and campus environments supports the development of a positive school culture; improved connectivity among students with teachers, peers, and school staff; and reduced reports of depression, stress, FoMO, and academic decline (Alhassan et al., 2018; Balhara et al., 2018; Beland & Murphy, 2015). This PSU study focuses on high school students grades nine thru twelve from a comprehensive and demographically diverse high school in the United States during the return to hybrid schooling in the midst of the COVID-19 pandemic. The research questions for this study included:

1. Do high school student use smartphones to support their learning?
2. Do high school students report behaviors of Problematic Smartphone Use?
3. Are there differences in depression, stress, self-esteem, and grit among different grade levels?
4. Are depression, stress, self-esteem, and grit predictors of Problematic Smartphone Use?

Theoretical frameworks for this study included components of Internet Addiction Theory (Young, 1998), Compensatory Internet Use Theory (Kardefelt-Winther, 2014), Self-Esteem (Rosenberg, 1965), and Grit (Duckworth et al., 2007). Components of these theories explain why smartphone users can have positive and productive experiences upon initial interactions with the device, including increased personal communication, personal entertainment, and coping with boredom, stress, and depression. Then, the frequent use of the device leads to continual engagement and behavioral addiction, resulting in loneliness, stress, depression, low self-esteem, and lack of personal grit. Ironically, the initial positive intentions and uplifting interactions with the device can result in PSU behaviors if not addressed.

METHOD

The research study was approved by the University IRB Board and was conducted at a comprehensive four-year high school in the United States with the enrollment of approximately 3,200 students. A total of 319 participant surveys were used for data analysis (see Table 1).

Table 1

Demographic Characteristics of Participants (N = 319)

Demographics	*N*	%
Gender		
Female	182	57.1
Male	137	42.9
Age		
14	88	27.6
15	69	21.6
16	82	25.7
17	72	22.6
18	8	2.5
Grade		
9	105	32.9
10	61	19.1
11	82	25.7
12	71	22.3
Ethnic/Racial Background		
American Indian or Alaskan Native	2	0.6
Asian or Pacific Islander	81	25.4
Black or African American	11	3.4
Latino/Hispanic	63	20.0
White	162	51.0

Data Collection Process

School site administration and the school board provided permission to conduct this study. The high school attendance office assisted with school-to-home parent and student messaging and information distribution. School communication was done through the web application communication tool, Parent Square. The school messaging tool recruited participants and housed permission forms. Student recruitment was accomplished through an invitation published in the school weekly newsletter, along with links to parental consent and student assent forms. All interested parties digitally returned the consent and assent forms to a dedicated research email address.

After permissions were returned and stored in a secure database, an online survey link was sent to the student's unique school email. Reminder emails were sent two additional times to students. The student recruitment process and opportunity to participate in the survey lasted five weeks during the Fall academic term. The student data collected was then analyzed using the advanced statistics software, SPSS, and compared to the Fall semester academic, non-weighted GPA, acting as the measured variable of student academic performance.

The online survey had 79 questions that took approximately 15 minutes to complete. The first part of the survey included 21 questions about student smartphone personal utilization. The second part of the survey included several instruments that measured PSU, depression, perceived stress, self-esteem, and grit.

Smartphone Addiction Scale Short Version (SAS-SV)

The Smartphone Addiction Scale Short Version (SAS-SV) developed by Kwon, Kim, et al. (2013) measured smartphone addiction behaviors and, depending on the total score, identified users having smartphone addiction (PSU). The SAS-SV contained 10 questions focusing on factors of daily-life disturbance, positive anticipation, withdrawal, cyberspace-orientated relationships, overuse, and tolerance. Questions were answered with a six-point Likert scale with the maximum score of 60 points. Higher overall scores indicated PSU of greater severity (Kwon, Kim, et al., 2013). The recommended cut-off score demonstrating smartphone addiction was 31 for males and 33 for females based upon similar studies conducted by Lee et al. (2018).

Center for Epidemiologic Studies-Depression Scale (CES-D)

The Center for Epidemiologic Studies-Depression Scale (CES-D) measured depressive symptoms of the individual during the past week (Radloff, 1977). The CES-D had 20 statements rated with a Likert-type scale with the score range of 0-60 points. Higher scores indicate higher levels of depression among the students. A score of 16 points or higher was considered at risk for depression (Hann et al., 1999).

Perceived Stress Scale (PSS)

The Cohen's Perceived Stress Scale (1983) measured the degree to which situations in one's life are assessed as stressful to the individual. The PSS had 10 questions related to feelings and thoughts during the last month rated on a five-point Likert-scale with the total score range of 0-40. Higher scores indicated a higher perceived stress. Scores totaling 0-13 indicated low stress, scores of 14-26 indicated moderate stress, and scores of 27-40 indicated high stress (Cohen et al., 1983).

Rosenberg's Self-Esteem Scale (RSES)

The Rosenberg Self-Esteem Scale (RSES) measured levels of self-esteem with questions that focused on self-worth and self-acceptance. The RSES had 10 statements ranked on a Likert four-point scale with the score range of 0-30. Scores between 15 and 25 were within the normal range and scores below 15 suggested low self-esteem.

Short Grit Scale (GritS)

Duckworth and Quinn's (2009) Short Grit Scale (GritS) measured the individual non-genetic trait of grit. The GritS had eight questions focusing on consistency of interests and perseverance of effort. Questions were rated using a five-point Likert-scale. The GritS was scored by computing a total score after select items were reverse scored and divided by eight. The maximum score on the scale was 5 (extremely gritty) and the lowest score was 1 (not at all gritty)

Reliability is supported with each instrument reporting a Cronbach's alpha coefficient between .70 and .97. Validity is supported with each instrument measuring the intended data with references to similar studies that utilized the instruments to assess smartphone addiction, depression, stress, self-esteem, and grit among middle school and high school students (Duckworth and Quinn, 2009; Lee et al., 2018; Liu et al. 2020; Roberts, 1980; Wang et al., 2017).

RESULTS

Student participants reported using their smartphone between three to nine hours per day. Results indicated that 19% of students were always distracted and 64% were somewhat distracted by the smartphone when completing work outside the classroom. Additionally, 61% of students specified having the phone next to the bed or on the bed when sleeping. Also, 22% of students reported definitely spending and 44% reported probably spending too much time on their smartphone. When students were asked about smartphone usage during the COVID-19 school closures, 50% of students reported, I spent a lot more time on my smartphone, 34% reported, I spent slightly more time on my smartphone, 11% reported, I spent the same amount of time on my smartphone, and 4% reported, I spent slightly less time on my smartphone.

Survey results showed that 100% of student participants owned a smartphone. Survey results indicated 78% of students used the smartphone in the classroom to support learning. Smartphone functions utilized in the classroom to support learning included Google Classroom, internet browsers for research, calculators, video tutorials, listening to music, texting peers,

timers, and alarms. Additionally, 79% of student participants continued using the smartphone outside of the classroom to complete assignments using these same applications. See Table 2.

Table 2

Summary of Smartphone Use Inside and Outside the Classroom to Support Learning

	Google Classroom	Internet Research	Calculator	Tutorial Videos	Contact a Friend	Timer / Alarm
Inside Class	78%	56%	58%	27%	20%	38%
Outside Class	79%	58%	61%	41%	57%	38%

Problematic Smartphone Use (PSU) among Students

Results showed 23% of male high school students having PSU and 21% of female students having PSU. While the scale cut off points are recommended at 31 for males and 33 for females, data identified the high percent of students approaching these thresholds, including 67% for male participants and 68% for female participants.

A one-way ANOVA was conducted to compare the PSU scores among the high school grade levels. Results confirm significant relationships between the grade levels and PSU, with grade 9 having a significantly lower level of PSU than grades 10 and 12.

Depression, Stress, Self-Esteem, and Grit

One-way ANOVAs were conducted to compare depression, stress, self-esteem, and grit scores among different grade levels. Result indicated 45% of all the participants as being at risk for depression, including 38% in 9th grade, 50% in 10th grade, 43% in 11th grade, and 56% in 12th grade. The ANOVA confirmed significant relationships between the grade levels and students at risk of depression as the grade level increased.

The ANOVA results found no significant differences among grade levels for stress, self-esteem, and grit. Results classified 48% of all participants as having low stress, 32% of participants as having moderate stress, and 20% of participants as having high stress. Results showed 22% of total participants with low self-esteem, 60% with normal self-esteem, and 18% with high self-esteem. Participants from all grade levels have average level of grit.

Pearson correlations were used to identify significant positive and negative relationships among the variables of PSU (SAS-SV), depression, stress, self-esteem, grit, and academic performance as indicated by GPA (Table 3). Smartphone addiction had significant positive correlations with depression and stress, meaning the higher the level of smartphone addiction the higher the depression and increased stress. Smartphone addiction had a significant negative relationship with self-esteem and grit, meaning the higher the smartphone addiction the lower the self-esteem and grit. Smartphone addiction had a very low negative relationship with academic performance, but not to a level of significance. Three variables have significant correlations with academic performance (GPA): depression had significant negative correlation with GPA, while self-esteem and grit had significant positive correlations with GPA.

Table 3

Correlations of Measured Variables

Variable	SAS-SV	CES-D	PSS	RSES	GritS	GPA
Smartphone Addiction Scale Sort Version (SAS-SV)	--	.23**	.29**	-.15*	-.24**	-.05
Epidemiologic Studies Depression Scale (CES-D)		--	.78**	-.72**	-.41**	-.13*
Perceived Stress Scale (PSS)			--	-.67**	-.43**	-.10
Rosenberg's Self-Esteem Scale (RSES)				--	.50**	.14*
Grit Scale Short Version (GritS)					--	.17 **

Note. *$p < .05$, **$p < .01$

To address the question, are depression, stress, self-esteem, and grit predictors of Problematic Smartphone Use, multiple regression was used to analyze the independent variables of depression, stress, self-esteem, and grit as predictors of smartphone addiction. Result of the simultaneous regression model indicated that stress, self-esteem, and grit were significant predictors of smartphone addiction, $F(4,287) = 10.951$, $p < .001$, adjusted $R^2 = .12$. From this model, depression was the only variable that was not a significant predictor of smartphone addiction (Table 4).

Table 4

Multiple Regression Analysis Summary for GritS, RSE, and PSS predicting SAS

Measure	*B*	*SE B*	β	*t*	*p*
Grit	-2.84	.86	-.21	-3.31**	.001
Self Esteem	.29	.11	.23	2.63**	.009
Perceived Stress	.34	.10	.31	3.42***	<.001
Depression	.05	.07	.06	.67	.503

Note. $R^2 = .13$, Adjusted $R^2 = .12$; ** $p < .01$, *** $p < .001$

DISCUSSION

The main goal of this study was to assess for associations among PSU, depression, stress, self-esteem, grit, and academic performance. Multiple findings within this study support current research on this topic. In this study, 100% of the participants owned a smartphone device. This finding supports Anderson and Jiang (2018) and Vogels (2019) finding that 95% of American teenagers incorporate the device into daily life. Smartphones applications now include the innovative abilities to easily execute communication and daily functions of office publication and work efficiency, personal organization, home and car security, and monitoring human health. The increased incorporation of daily life functions on the smartphone was also earlier reported in the research of Demerici et al. (2015), Elhai et al. (2019) and Fischer-Grote et al. (2019).

Smartphone users in this study found themselves in the stressed space of benefiting from smartphone applications to communicate, as well as support learning, and approaching or being addicted to the device. Students in this study are challenged to practice awareness and self-discipline to pull themselves away from the phone as reported by 79% of students who use the smartphone outside of the classroom to complete assignments, as well as 83% of participants who were distracted by the smartphone when completing work outside the classroom and 44% of the participants who admitted to spending too much time on the phone.

The overall findings of this study continue to support previous smartphone research. Kwon, Kim, et al. (2013) shared that the smartphone does not discriminate with 23% male and 22% female students scoring levels indicating PSU and 67% of males approaching and 68% females approaching scores indicating PSU. Interestingly, results did identify a significant relationship between grades 10 - 12 and PSU, but not a significant relationship between grade 9 and PSU. This lack of significant relationship between grade 9 and PSU may be supported by the study's theoretical framework of Compensatory Internet Use Theory. This theory states that smartphone users can have initial positive and productive interactions with the device, including increased personal communication, personal entertainment, and coping with boredom, stress, and depression. Then, the frequent use of the device leads to the development of PSU. This theory may apply to grades 10-12 when the student becomes more dependent on the application functions and has established social media interactions with other high school peers and social media followers.

Another point of discussion identified with the findings is that 45% of all participants were at risk of depression, including 38% in 9th grade, 50% in 10th grade, 43% in 11th grade, and 56% in 12th grade. Results also indicated a significant positive relationship between depression and PSU, alerting that the 45% of students at risk of depression could develop PSU. Findings of depression linked to PSU were also found in Alhassan et al. (2018), Fisher-Grote et al. (2019), and Horvath et al. (2020).

Results from this study also found a significant relationship among PSU and grades 10-12. This finding increases the urgency to educate students with awareness of signs of depression and PSU and educating students with mitigating strategies for PSU. Since there was no significant relationship between PSU and 9th grade, this may be the best timeframe for PSU awareness conversations to begin in the transition into high school and continuing throughout grades 10-12. Educators also

need to implement the electronic device policy provided in California Assembly Bill 272 to limit smartphone use in the classroom before students develop a heavier dependency on the device.

In addition to depression, this study also found a significant positive relationship between stress and PSU, similar to findings from previous studies (Do et al., 2020; Kwok et al., 2017). Results from this study indicated that 52% of participants have moderate to high stress, which supports the need for interventions to help reduce stress for all students.

Similar to findings from Wang et al. (2017), this study found a significant negative relationship between PSU and self-esteem, with 22% of the participants identified as having low self-esteem. Moreover, results indicated that stress, self-esteem and grit are predictors of PSU. Students of all ages, but especially high school teenagers, need to be educated to understand the impact of these variables and PSU. With grit being another significant predictor of PSU, it is important to discuss grit among students. As described by Duckworth and Quinn (2009), grit is a non-genetic character trait that can be learned and developed and is a key factor to the success of personal goals. The more interventions schools can provide to increase the level of grit among students, the less PSU students will have.

These findings reiterate the importance of early and continual intervention and awareness. Conversations need to begin at the onset of high school, in partnership with schools enforcing electronic management policy, limiting the phone use in the classroom. The reduction of smartphone devices in the classroom offers the space for students to understand the positive impact of interpersonal connection, self-efficacy of personal success and satisfaction that comes from interpersonal classroom instruction. Educators need to use strategically crafted phone-free time to educate students on how to balance the use of the device in their day.

IMPLICATIONS

This study set out to assess for associations among PSU, depression, stress, self-esteem, grit, and academic performance, in addition to encouraging the enforcement of California Assembly Bill 272 and to implement more robust and thoughtful classroom smartphone policies. Even though in the findings PSU had a non-significant, low negative relationship with GPA, PSU has a significant relationship with depression, which has a significant correlation to GPA. Understanding the connections between PSU and depression as well as between depression and GPA is important for students to identify and discuss with educators, parents, and mentors. The same can be stated with self-esteem. Smartphone addiction has a significant negative relationship with self-esteem, and self-esteem has a significant correlation with GPA. The same is for grit. PSU has a significant negative relationship with grit and grit has a significant positive correlation with GPA. So, having low PSU and rising grit could positively influence GPA.

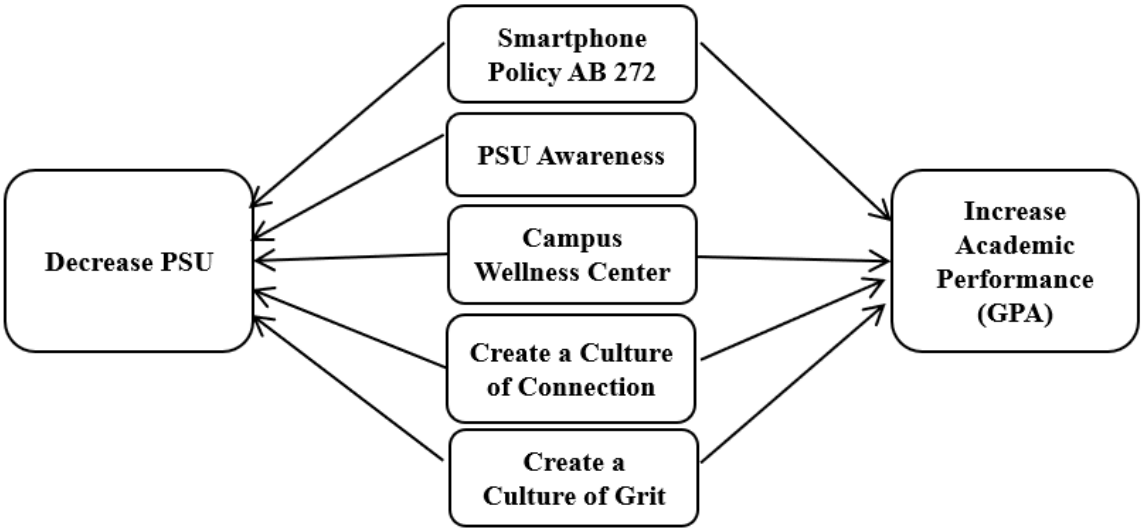
The results of this study indicate a need for stakeholder education and awareness, PSU intervention programs, smartphone policy in the classroom, and building school communities that support reduced smartphone usage with a focus on increased student mental health and physical well-being. Recommendations for these implications are to (1) decrease PSU among students with the implementation of smartphone classroom policy; (2) provide alternative instructional devices such as 1:1 Chromebooks, tablets, laptops, or iPad; (3) educate stakeholders on the reality and harms of PSU; and (4) establish mental health supports on high school campuses and create a culture of campus connectedness and grit. Figure 1 represents program concepts to establish within the high school campus to decrease PSU and increase student mental health, well-being, and academic performance.

CONCLUSION

In conclusion, it is important to communicate with students beginning in grade 9 and throughout high school on the relationships of PSU and stress, depression, self-esteem, and grit, and how some of these variables can impact academic performance. Understanding that students will engage with the device for positive, efficient, and personal leisure, for several hours outside of the classroom space, educators need to encourage conversations that focus on the removal of the device in the classroom, enforcing the 2019 electronic device policy California Assembly Bill 272. The goal to educate students, educators, district administrators, and community stakeholders on the effects of PSU will hopefully implement robust and thoughtful classroom smartphone policies in order to promote smartphone balance, health, life satisfaction and the academic performance of high school students. Limitations of this study include participants being at one high school site. Future studies are recommended for continued PSU research at several middle and high schools post pandemic to understand the growing influence and role the smartphone has on students inside and outside the classroom instruction to encourage a healthy balance in the use of the device.

Figure 1

Recommendations for Decreased PSU and Increased Academic Performance



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