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## MEDIA & COMMUNICATION STUDIES | RESEARCH ARTICLE

# The good, the bad, and the Internet: Investigating the impact of online prosocial and anti-social behaviors on well-being

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**Abstract:** Studies have acknowledged how Internet use can lead to increased loneliness, but while Internet use can lead to various types of behavior, less research has been done comparing the effects of different Internet behaviors on loneliness, such as prosocial and antisocial behaviors. Using survey data collected in Singapore, this study finds that online prosocial behavior reduces loneliness only when it enhances satisfaction with life, while online antisocial behavior increases loneliness only when satisfaction with life is unaffected. The findings provide support to the positive effects of engaging in pro-social behavior and suggest that a more reflective use of the Internet, such as engaging only in pro-social behavior, can help contribute to higher life satisfaction among users.

**Subjects:** Cognitive Psychology; Mental Health; ICT; Interpersonal Communication; Mass Communication

**Keywords:** Internet use; prosocial behavior; antisocial behavior; satisfaction with life; loneliness

The Internet is no longer a technological innovation. It has become part of the daily lives of millions of people, with active Internet users reaching 59.6% of the global population as of January 2021 (Johnson, 2021). Deeply embedded in the daily functions of societies and individuals, the Internet has been the subject of numerous studies, many of which have focused on the effects of Internet use (IU) on people's physical, behavioural, and psychosocial well-being (Clark et al., 2004). While the Internet brings benefits in terms of accessibility and ease of obtaining

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information, entertainment, and communication (Kadli et al., 2010), extensive research has demonstrated that increased IU frequency is associated with decreased psychological well-being (Kraut et al., 1998; Schiffrin et al., 2010), which is associated with feelings of loneliness (Stepanikova et al., 2010). Loneliness is characterised as a deficiency in social relationships, with severe distressing effects on individuals (Weiss, 1973). It is a global phenomenon that has been associated with negative health consequences, such as heart diseases, stroke, and hypertension (Petitte et al., 2015), as well as psychological consequences (e.g., depression) that may even result in suicide (Killgore et al., 2020).

Loneliness has also been found to be positively associated with IU frequency (Kraut et al., 1998). One possible explanation is that as individuals focus on and invest more time in online relationships, this may be at the expense of neglecting real-world contacts, leading to decreased communication with family members and social circles (Erdoğan, 2008). However, it may not just be due to IU frequency or the amount of time spent online. It may also be due to *how* individuals spend their time on the Internet, that is, what specific behaviors they engage in while they are online. While existing studies have examined the relationship between IU frequency and loneliness, it remains unclear what specific Internet behaviors may be associated with loneliness. Information on this may help in proposing interventions to minimize the impact of IU on loneliness.

Indeed, not all Internet behaviors are the same, and they may be broadly classified as antisocial behaviors (AB) and prosocial behaviours (PB) (e.g., Wright & Pendergrass, 2019). Studies have examined the effects of engaging in PB (Song et al., 2019) and AB (Bogart et al., 2007) on satisfaction with life (SWL), which has been found to be related to loneliness. Lonelier individuals tend to report lower SWL (Goodwin et al., 2001; Ozben, 2013). However, it remains unclear how certain types of Internet behavior—such as antisocial and prosocial behaviors—affect feelings of loneliness. Thus, to further expand the research on this area and to gain a greater understanding of the relationship between IU and loneliness, this exploratory study draws from a cross-sectional survey design to propose and test a theoretical model of IU and loneliness that accounts for the interrelationships between AB, PB, and SWL. This is done in the context of Singapore, a small country with a high Internet penetration rate (J. Müller, 2021).

## 1. Literature review

This exploratory study seeks to propose and test a theoretical model accounting for the relationship between IU and loneliness based on earlier theoretical frameworks that explicated loneliness as well as on the growing literature on the impact of IU on loneliness. It seeks to add to this scholarship by accounting for the potential role of engaging in specific types of Internet behavior as well as the role of life satisfaction.

### 1.1. Internet use and loneliness

Through the Internet, a lot of people are now more connected than ever, at least on digital spaces, as the Internet facilitates interpersonal communication and social support. However, many people still feel lonely (e.g., Cotten et al., 2013; Wallinheimo & Evans, 2022). Thus, many scholars have sought to examine loneliness. For example, Weiss (1973) explicated loneliness as comprising two dimensions: emotional and social. The former refers to individuals' feelings of emptiness "due to the lack of intimate relationships", while the latter refers to "the feeling of boredom due to the lack of sense of community or meaningful friendships" (Moody, 2001, p. 394). Others defined loneliness as a "self-perceived state" where an individual perceives their social network of relationships to be deficient in terms of size and deemed unsatisfactory (Jones, 1981, p. 295). Building on these definitions, others have examined factors that may lead to loneliness across different groups of people, including poor health, living alone, and low social relationships among the elderly (Cohen-Mansfield et al., 2016), as well as personality types, low self-esteem, and social anxiety among adolescents (Mahon et al., 2006). Others proposed a model of loneliness by examining where individuals live (e.g., urban areas) and what they do (e.g., social interactions) (MacDonald et al.,

2020). A common factor across these proposed models and frameworks is how *social interactions* can impact loneliness (Moody, 2001; Weiss, 1973).

Such social interactions now increasingly occur in online spaces as more and more individuals spend more time using the Internet. Thus, many studies have examined the relationship between IU frequency and loneliness. However, findings from cross-sectional surveys on the psychosocial impact of IU have been equivocal. On the one hand, studies have found that IU has adverse psychosocial impacts. For example, in a study of Portuguese adolescents, Costa et al. (Song et al., 2019) found that online communication has a direct effect on one's loneliness. On the other hand, higher frequency of IU for communication was found to be associated with a lower level of loneliness among older adults (Sum et al., 2008). Likewise, in a study of IU by older adults in assisted living communities in the US, Cotten et al. (2013) found that the IU frequency is negatively associated with feelings of loneliness. This is because using the Internet facilitates the formation and maintenance of new social ties as well as making social support more accessible.

However, the cross-sectional nature of these studies is a clear methodological limitation as they can only provide a snapshot of the relationship between IU and loneliness within a specific time period. Thus, other studies rely on longitudinal approaches in studying this relationship. One advantage of examining this relationship longitudinally is that it can sufficiently traverse multiple time periods to examine the effect of IU on loneliness by accounting for time-order. For example, an early study on the psychosocial impacts of IU saw that an increase in IU frequency in an earlier time period leads to a statistically significant decline in long-term offline social involvement in another time period, which impacts loneliness (Kraut et al., 1998). Similarly, Tandoc and Goh (2021) also found in a three-wave study involving adults in Singapore that hours spent on Facebook at an earlier time point was positively related to experiencing depression symptoms at a later time point. Thus, evidence from longitudinal studies seems to point out that higher IU frequency is related to higher levels of loneliness. Following these studies, we predict that:

**H1:** IU frequency has a positive relationship with feelings of loneliness.

### **1.2. The role of prosocial and antisocial behaviors**

Another potential explanation for why cross-sectional studies have found competing results when examining the link between IU and loneliness is that measuring IU frequency in general terms, such as time spent online, does not account for the fact the individuals engage in a range of activities when they are on the Internet. Different online activities may have differential effects on loneliness. Thus, this exploratory study proposes a model of Internet-induced loneliness that accounts not only for the amount of time people use the Internet but also for what people do online (i.e., Internet behaviors), consistent with studies that examined the impact on loneliness of what people do offline (e.g., MacDonald et al., 2020). Informed by the theories and meta-analyses regarding loneliness that highlight the important role of social interactions, this current study focuses on Internet behaviors that are oriented *toward others*. One way of typologizing such other-oriented behaviors is whether they are antisocial (AB) or prosocial (PB). Such a typology has already been examined in numerous studies in the offline context. AB refers to any behavior that violates social rules and norms or acts against others, regardless of severity (Kazdin, 1987). For example, Fagan (1975, p. 7) defined AB as "recurrent violations of socially prescribed patterns of behaviours." On the other hand, PB refers to actions that seek to benefit others, which includes helping, volunteering, and sharing (Penner et al., 2005). AB and PB may be inversely related (Bartal, 1976).

While such distinction was initially examined in offline settings, behaviors on the Internet have also been likened to daily offline social behaviours, which may also be classified as either AB or PB (Ma, Li, et al., 2011). Veenstra (2006) found that AB and PB are potentially two individual dimensions that can exist at the same time, and individuals can show any combinations of the two

behaviors. Online PB can be defined as voluntary actions executed in an electronic context intending to benefit others and form good relations with them (Erreygers et al., 2018), while online AB includes antisocial, illegal, or aggressive behaviors, such as cyber-bullying or hate speech (Ma, Chu, et al., 2011). AB and PB are not necessarily mutually exclusive online (Erreygers et al., 2017).

Studies have found that the frequency of IU is positively associated with both online AB and PB. For example, in a study on misbehaviors among Turkish college students, Metin-Orta and Demirutku (2020) found a direct relationship between the time students spend on the Internet and their cyberloafing behaviors during class (e.g., following news, online shopping, socialization in social media platforms). Likewise, in a study of cyberbullying among teenagers in Indonesia, Setiana et al. (2021) suggested that one of the causes is the high frequency of IU (especially on social media platforms). However, IU frequency can also be associated with online PB. For example, in a study of two specific forms of online PB (i.e., help-giving and moral courage), Kinnunen et al. (2016) demonstrated that weekly use of the Internet enhances willingness to help others online. However, these studies have examined online AB or PB separately, not both at the same time. Thus, in this study, we examine both types of others-oriented Internet behaviors, and consistent with the literature, we predict that:

**H2a:** IU frequency is positively associated with online PB.

**H2b:** IU frequency is positively associated with online AB.

### **1.3. Internet behaviors and well-being**

How does engagement in particular types of Internet behaviors impact loneliness? Scholars have established how engaging in prosocial behavior reduces loneliness. Lanser and Eisenberger (2022) found in an experiment that participants who engaged in gift-giving reported decreased levels of loneliness. A panel study involving middle-school students found that those in schools with stronger peer prosocial norms felt less anxious and lonely over time (Schacter & Juvonen, 2018). Incorporating prosocial acts in one's behavioral processes can increase life satisfaction levels (Dou et al., 2019). One potential explanation for this is that when individuals engage in PB that helps or benefits others, they may perceive having—or even actually engage in—positive social contacts and interactions (Lanser & Eisenberger, 2022). While others also examined how feeling lonely can reduce engagement in prosocial behaviors (e.g., Twenge and Baumeister, 2004), most studies tested the impact of engaging in prosocial behaviors on loneliness. For example, Nguyen et al. (2020) found that engaging in PB can reduce levels of loneliness more than engaging in normal activities. This is further supported by Gloster et al. (2020), who posited that an increase in PB can lead to a decrease in both loneliness and social discord. Thus, we also predict that:

**H3a:** Online PB is negatively associated with loneliness.

In contrast, studies have found a positive link between AB and loneliness and the literature has explored bidirectional relationships between them. On the one hand, some studies have found that an increase in loneliness leads to an increase in AB (e.g., Bagwell, 2004). For example, DeWall and Richman (2011) supported such an association by drawing a link between social exclusion and AB, with those socially excluded more likely to engage in AB. However, other studies have also found the opposite direction, that engaging in AB tends to increase loneliness (Ren et al., 2018). This can be explained by the consequences of engaging in AB, which may involve counterattacks from others, such as getting involved in arguments, which may lead one to perceive having low-quality social relationships or being excluded. These bidirectional findings are consistent with debates on how the relationship between IU and loneliness is bidirectional.

However, recent cross-lagged panel studies investigating the link between IU frequency and well-being have considered both directions and found stronger support for hypothesizing the effects of IU frequency on well-being. For example, Tandoc and Goh (2021) demonstrated that the long-term effects of Facebook use are associated with a subsequent increase in depression symptoms among users. Specifically, increased time spent on Facebook at Time 1 is positively related to depressive symptoms at Time 2, which is associated with more Facebook use at Time 3. Similarly, Jarman et al. (2022) found that the frequency of social media use at Time 1 drives psychological distress at Time 2, which is associated with a higher frequency of social media use at Time 3. Guided by these studies, this exploratory study also predicts that:

**H3b:** Online AB is positively associated with loneliness.

**RQ1:** Do online PB and AB mediate the relationship between IU frequency and loneliness?

#### 1.4. Satisfaction with life and loneliness

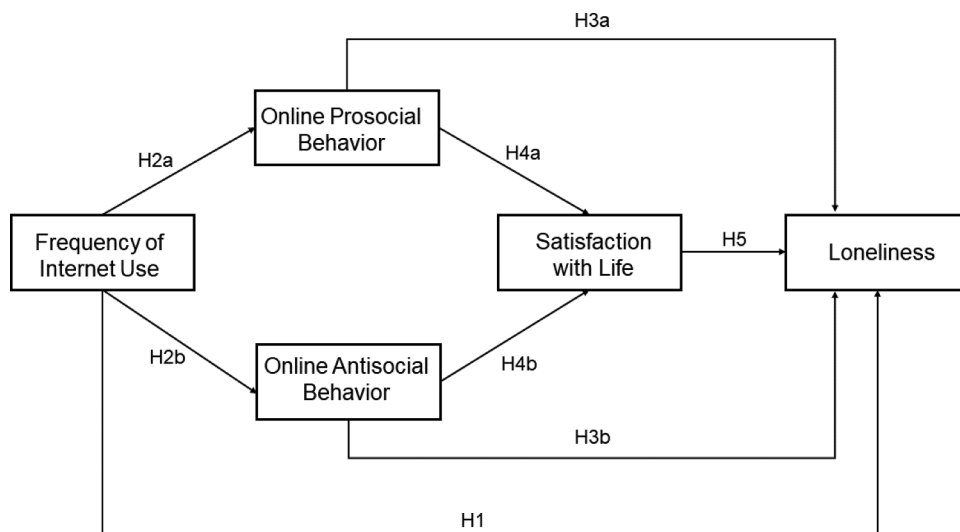
Many studies that have examined the consequences of PB and AB have focused on their impact on satisfaction with life (SWL). Studies have defined SWL as a conscious evaluation of one's life on the basis of individual requirements (Pavot & Diener, 2008). Studies have shown that AB is negatively related to SWL (e.g., Aruguete et al., 2019). For example, Bogart et al. (2007) found that individuals who engage in AB (e.g., hard drug use) have lower levels of SWL. In contrast, studies have found that PB is positively associated with SWL (Song et al., 2019). For example, Song et al. (2019) found that charitable behavior was positively associated with SWL. Therefore, continuing the pathways in this current study's proposed model (see Figure 1), we predict that:

**H4a:** Online PB is positively associated with SWL.

**H4b:** Online AB is negatively associated with SWL.

Indeed, SWL is an important factor to account for when explaining why people feel lonely. Many studies have consistently found a negative relationship between SWL and loneliness (e.g., Goodwin et al., 2001), although such relationships have also been tested bidirectionally.

Figure 1. Conceptual model.



In an early multinational survey conducted on Australians and Japanese, Schumaker et al. (1993) found that Australian participants self-reported lower levels of loneliness, which translated to higher SWL. However, SWL among Japanese participants remained largely independent of their level of loneliness. Other studies tested the opposite direction, finding that when people have low SWL, they are more likely to feel lonely (Crous & Bradshaw, 2017). For example, in a study of students and nuns in Angola and Portugal, Neto and Barros (2003) found that their level of satisfaction with life negatively predicts their feelings of loneliness. Given this current study's proposed framework to examine loneliness, we also predict that:

**H5:** SWL is negatively associated with loneliness

**RQ2:** Does SWL mediate the relationships between IU frequency, PB, AB, and loneliness?

## 2. Method

This study is based on a cross-sectional online survey conducted in Singapore in December 2021. Singapore, a small city-state that has the third highest Internet penetration rate in Southeast Asia (J. Müller, 2021) along with high digital literacy rates, is a good place for investigating Internet behaviors (AB and PB) as well as their impact on well-being (i.e., feelings of loneliness and satisfaction with life).

A private polling company based in Singapore recruited participants by sending a recruitment email to its panellists in Singapore. Only those who are aged 21 and above and residing in Singapore at the time of the survey received the recruitment email. Those who accepted the invitation were then directed to the online survey questionnaire, which was hosted on Qualtrics, a commercial survey platform. A total of 1,016 participants (48% female) completed the online survey. The average age in the sample was 42.3 ( $SD = 12.2$ ). The sample takes into consideration that Singapore is a multi-racial society and hence involves different ethnic groups. Overall, quotas were set to ensure our sample mirrors Singapore's general adult population in terms of demographic factors: Chinese as the ethnic majority (see Table 1), median age (41 years old), and citizenship (majority as Singapore citizens). The Institutional Ethics Review Board (IRB) at the authors' University approved the study. Participants were also asked for their informed consent and permission, in accordance with the IRB guidelines, prior to completing the online questionnaire.

**Table 1. Sample demographics**

Demographic breakdown	Sample ( $n = 1,016$ ) (%)	Population <sup>a</sup> (%)
Median age	41.0	42.2
Ethnicity		
Chinese	85.4	75.9
Malay	7.9	15.0
Indian	4.9	7.5
Others	1.9	1.6
Citizenship		
Singaporean	87.4	61.9
Singapore Permanent Resident	11.3	9.14
Foreigner (Non-Resident)	1.4	28.8

<sup>a</sup>Retrieved from the Population in Brief 2020 report. <https://www.strategygroup.gov.sg/media-centre/publications/population-in-brief>.

## 2.1. Measurements

### 2.1.1. Internet use (IU) frequency

Guided by previous studies' operationalization, IU frequency was measured by asking participants to indicate the number of hours a day they spend on seven Internet activities: Reading online newspaper, magazine, or book; Watching video-streaming sites (e.g. Netflix); Listening to music streaming service (e.g. Spotify); Playing online games; Using social media (e.g. Facebook); Using messaging apps (e.g. Whatsapp); and Using video-conference tools (e.g. Zoom) ( $M = 2.48$ ,  $SD = 2.70$ ,  $\alpha = 0.96$ ). Details of the measurement items for the key variables used in this study can be found in the Appendix (Supplemental Information).

### 2.1.2. Prosocial behaviour

This study adapted seven items from the help-giving subscale of the 23-item Online Prosocial Scale, developed by Kinnunen et al. (2016). These help-giving items are selected for being oriented toward others. The participants were asked to evaluate how often they engaged in each of the given behaviours on a 5-point scale (1=Never to 5=Always) ( $M = 2.35$ ,  $SD = 1.07$ ,  $\alpha = 0.95$ ). For example, respondents rated the following items: "I actively answer other users' questions on the Internet" and "I comment anonymously on other people's blog entries in a positive way".

### 2.1.3. Antisocial behaviour

Participants were asked to evaluate how often they engaged in each of nine behaviors identified from previous studies on problematic Internet use using a 5-point scale (1 = Never to 5 = Very Often), such as calling people names to make them feel embarrassed, intimidated, or bad; lying to others online; stalking or harassing someone online; using offensive and hateful words online; and posting inflammatory messages to make others angry or annoyed, among others. The self-developed scale is reliable,  $M = 1.90$ ,  $SD = 1.16$ ,  $\alpha = 0.98$ .

### 2.1.4. Satisfaction with life

This study adopted the Satisfaction with Life Scale, a commonly used measure of life satisfaction (Diener et al., 1985). It has been used in numerous studies that examined satisfaction with life (Şimşek et al., 2021). The current study employs this 5-item scale, asking the participants to evaluate their agreement with each statement. The items (e.g., "In most ways my life is close to my ideal") are rated on a 5-point Likert scale (1 = Strongly disagree to 5 = Strongly agree). The scale is reliable,  $M = 3.37$ ,  $SD = 0.87$ ,  $\alpha = 0.91$ .

### 2.1.5. Loneliness

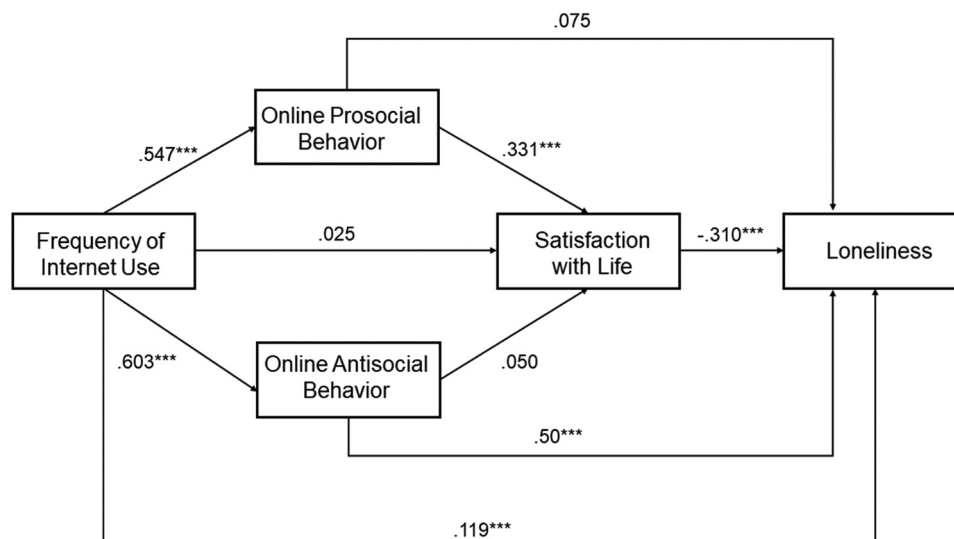
The current study employed a validated 3-item loneliness scale (Hughes et al., 2004). The scale includes the following items, rated by participants in terms of how frequently they have felt each of the following: lack companionship, felt left out, felt isolated from others. The items are rated on a 5-point scale (1=Never to 5=Always). The scale is reliable,  $M = 2.72$ ,  $SD = 1.07$ ,  $\alpha = 0.93$

## 3. Data analysis and results

Structural equation modelling (SEM) was conducted using R (lavaan package) to test both direct and mediation effects. The mediation analysis aims to find out how IU frequency relates to online PB and AB, how online PB and AB relate to satisfaction with life (SWL), and how satisfaction with life is linked to loneliness, with PB, AB, and SWL as mediators. Overall, the model demonstrated a good fit:  $CFI = .969$ ,  $TLI = .955$ ,  $RMSEA = .064$ . Figure 2 illustrates the direct paths in this SEM model, while Table 2 shows the correlation coefficients for the key variables. Table 3 summarizes both the direct and indirect effects of this model.

**Figure 2. SEM model depicting direct paths.**

Notes. \*\*\* $p < 0.001$ . Standardized paths coefficients are presented.



**Table 2. Correlation matrix showing correlation coefficients for IU, PB, AB, SWL, and loneliness**

		1	2	3	4	5
1	IU	1				
2	PB	0.545**	1			
3	AB	0.598**	0.761*	1		
4	SWL	0.225**	0.374**	0.314**	1	
5	Loneliness	0.360**	0.385**	0.508**	-0.81*	1

H1 proposed that IU frequency is positively related with loneliness. The results show that IU frequency has a positive relationship with loneliness;  $\theta = .119$ ,  $SE = .033$ ,  $p < .001$ , 95% CI [.051 to .180], thus H1 is supported.

H2a and H2b predicted that IU frequency is positively related to both online PB and online AB. The results show that IU has a positive association with both PB,  $\theta = .547$ ,  $p < .001$ ,  $SE = .027$ , 95% CI [.514 to .621]; and AB,  $\theta = .603$ ,  $p < .001$ , 95% CI [.608 to .716]. Thus, H2a and H2b are both supported.

H3a predicted that PB is negatively associated with loneliness. However, the results showed that PB does not have a significant relationship with loneliness;  $\theta = .075$ ,  $SE = .040$ ,  $p = .077$ , 95% CI [-.008 to 0.149]. Therefore, H3a is not supported.

H3b predicted that AB is positively related with loneliness. The results show that AB has a positive relationship with loneliness,  $\theta = .500$ ,  $SE = .040$ ,  $p < .001$ , 95% CI [.363 to .519]. H3b is supported.

RQ1 aimed to examine the mediating role of AB and PB in the relationship between IU frequency and loneliness. The results show that the indirect effect of IU frequency on loneliness through AB is significant;  $\theta = .301$ ,  $SE = .029$ ,  $p < .001$ , 95% CI [0.235 to 0.349]. However, it also showed that the indirect effect of IU frequency on loneliness through PB is insignificant;  $\theta = .041$ ,  $SE = .023$ ,  $p = .078$ , 95% CI [-.004 to .084]. Thus, while AB partially mediates the relationship between IU frequency and loneliness, PB does not.

H4a predicts that PB and SWL are positively related. The results show that PB indeed has a positive relationship with SWL;  $\theta = .331$ ,  $SE = .046$ ,  $p < .001$ , 95% CI [.224 to 0.405]. Thus, H4a is supported.

**Table 3. SEM results: Direct and indirect paths**

	$\beta$	SE	LLCI	ULCI	p-value
<b>Direct Paths</b>					
IU → AB	.603	.028	.608	.716	<.001
IU → PB	.547	.027	.608	.0716	<.001
IU → SWL	.025	.038	-.051	.100	.524
AB → SWL	.050	.045	-.043	.134	.319
PB → SWL	.331	.046	.224	.405	<.001
IU → Lone	.119	.033	.051	.180	<.001
AB → Lone	.500	.040	.363	.519	<.001
PB → Lone	.075	.040	-.008	.149	.077
SWL → Lone	-.310	.032	-.366	-.243	<.001
<b>Indirect Paths</b>					
IU → PB → Lone	.041	.023	-.004	.084	.078
IU → SWL → Lone	-.008	.0012	-.030	.016	.525
IU → PB → SWL → Lone	-.056	.010	-.074	-.035	<.001
IU → AB → Lone	.301	.029	.235	.349	<.001
IU → AB → SWL → Lone	-.009	.009	-.027	.009	.322

Standardized coefficients ( $\beta$ ) are presented.

H4b predicts that AB and SWL are negatively related. The results show that AB does not have a significant relationship with SWL;  $\beta = .050$ ,  $SE = .045$ ,  $p = .319$ , 95% CI [-.043 to 0.134]. Therefore, H4b is not supported.

H5 proposes that SWL is negatively related to loneliness. The results show that SWL has a negative relationship with loneliness;  $\beta = -.310$ ,  $SE = .032$ ,  $p < .001$ , 95% CI [-.366 to -.243]. Therefore, H5 is supported.

Finally, RQ2 aims to examine the role SWL plays in mediating the relationship between IU frequency, online PB and AB, and loneliness. First, the simple mediation pathway from IU frequency to loneliness through SWL was insignificant;  $\beta = -.008$ ,  $SE = .0012$ ,  $p = .525$ , 95% CI [-.030 to .016]. Next, the serial mediation indirect pathway from IU frequency to loneliness with serial mediators AB and SWL was found insignificant;  $\beta = -.009$ ,  $SE = .009$ ,  $p = .322$ , 95% CI [-.027 to .009]. Finally, the serial mediation indirect pathway with serial mediators PB and SWL was found to be significant;  $\beta = -.056$ ,  $SE = .010$ ,  $p < .001$ , 95% CI [-.074 to -.035]. Thus, increased IU frequency may lead to increased PB, which can improve SWL and ultimately reduce loneliness.

#### 4. Discussion and conclusion

Guided by the growing literature on the link between IU frequency and loneliness, this exploratory study sought to contribute to theorizing in this area by proposing and testing a theoretical model that accounts for the impact of engaging in prosocial and antisocial behaviors (i.e., PB and AB) as well as of life satisfaction. While studies have examined the link between IU frequency and loneliness, many of these studies do not distinguish between the different types of activities, uses, and behaviors that Internet users engage in, which may have differential effects on loneliness.

This study found a positive and significant relationship between IU frequency and loneliness (H1), consistent with studies that found a similar positive relationship between the two (Erdoğan, 2008; Kraut et al., 1998). However, not all Internet behaviors are the same. Thus, in this study, we also compared the effects of prosocial (PB) and antisocial (AB) behaviors online on loneliness. We found a positive and significant relationship between IU frequency and both online PB and AB (H2a and H2b). Such results are consistent with previous findings (Suler, 2004) and may be plausibly explained by particular affordances of the Internet that make engaging in these behaviors easy and attractive. For example, the sense of anonymity that the Internet provides may lead to disinhibition among individuals to engage in a range of behaviors they may otherwise not do in a setting where they may not be anonymous (Hirsh et al., 2011). For example, one of the items used to measure AB is “calling people names to make them feel embarrassed, intimidated, or bad.” In face-to-face settings, individuals may inhibit themselves from doing so as the showing of animosity to other individuals may require them to face the corresponding reactions; the cover of anonymity on the Internet may allow for the avoidance of such consequences.

The results also show a positive relationship between online AB and loneliness (H3b). While the Internet may embolden individuals to engage in online AB, doing so may instead increase loneliness. On the other hand, results also show an insignificant relationship between PB and loneliness (from H3a). Although previous studies have found PB to be negatively related to loneliness (e.g., Twenge et al., 2007), these studies sought to explain the relationship in an offline context. Online, engaging in PB may be motivated by transactional reasons of need for social approval or respect by others on the Internet (Erreygers et al., 2018). These motivations, rather than pure altruism, for engaging in online PB may explain why engaging in online PB may not necessarily directly reduce loneliness.

The current study also found that the negative link between online PB and loneliness is mediated by satisfaction with life. In other words, individuals who engage in PB and become more satisfied with life as a result may also experience less loneliness. Contrast this with the direct positive effect of online AB on loneliness. The results provide empirical evidence to the assumption that doing good, even online, may contribute to feeling good if it makes one feel satisfied with life. In contrast, engaging in antisocial behaviour can make people feel lonely. When juxtaposed with literature focusing on the other side of the bi-directional relationship between AB and loneliness, that people exhibiting high levels of loneliness also exhibit AB (e.g., Bagwell, 2004), this finding may be hinting at a loneliness spiral, where engaging in online AB can make people feel lonely, which may drive them to engage in even more online AB. This is an important assumption that future studies should explore.

The current study also provides support to earlier findings on the negative link between SWL and loneliness. The study also finds that while online AB does not have a significant relationship with SWL (Gudjonsson et al., 2009), individuals who exhibited high levels of online PB also have increased levels of SWL, which is negatively associated with feelings of loneliness. This is in line with existing studies (e.g., Song et al., 2019). A potential explanation is offered by Song et al. (2019) who posit that engaging in PB helps with affect regulation and self-acceptance. Lanser and Eisenberger (2022) also suggested that engaging in PB that helps or benefits others gives individuals the perception of having—if not actually having—positive social interactions with other people. In contrast, engaging in AB, which may function as a release or distraction that may provide short-term gratifications or pleasure for some (e.g., Sparavec et al., 2022), may instead expose people to subsequent arguments or counterattacks to their negative behavior, which may result in having low-quality interactions, if not social exclusion.

This study also found a significant serial mediation pathway from IU frequency through PB through SWL to loneliness: Individuals who use the internet frequently tend to have higher levels of online PB, which leads to higher SWL, which is then negatively related to loneliness. These results may point to the value of engaging in prosocial online behaviors to prevent or mitigate feelings of loneliness. In other words, spending time on the Internet may actually be good for

some individuals if they are doing good things while online. While existing studies focus on the communication aspect of IU (e.g., use of digital communication tools) to explain how it can reduce loneliness (e.g., Gabbiadini et al., 2020), this study further proposes that it is also important to consider specific types of online behavior, such as online PB, which can reduce feelings of loneliness through heightened SWL. At the same time, it is also important to consider users' online AB. This is because engaging in online AB is positively related with feeling lonely. Although numerous studies have shown that feelings of loneliness may arise from the maladaptive or excessive use of specific functions on the Internet, such as social media (e.g., Morahan-Martin & Schumacher, 2003), this study suggests that users' undesirable online behavior could be another important variable driving their feelings of loneliness.

#### **4.1. Study limitations and recommendations**

These findings must be viewed with some limitations. First, the cross-sectional design of the study limits its ability to derive causal interpretations and test bidirectional paths. For example, while we found support for our hypothesis that online AB is positively related to loneliness, it may also mean that lonely people may be more likely to subsequently engage in online AB. Thus, future studies should revisit our findings and retest our proposed model using longitudinal designs for stronger causal interpretations. Second, the study relies on self-reported data. IU frequency, online AB and PB, SWL, and loneliness were all measured and analysed based on self-reported data, which is often criticised for threats to its validity (Chan, 2010). Furthermore, online survey questionnaires are susceptible to social desirability biases. While we reminded respondents that their responses were anonymous, especially when self-reporting engaging in AB, it is plausible that some respondents may have underreported their online AB, affecting the results. Similarly, individuals may have overreported their online PB to make themselves look better. Future studies may consider alternative methods of measurement as well as control for factors such as social desirability.

Third, the measurement for IU frequency involves the amount of time spent on social media. However, such measurement is broad in a sense that one's time spent on social media encompasses a broad range of activities, which could potentially influence their online AB and PB. Future studies should examine mechanisms that may help to further explain the relationships uncovered in this exploratory study. For example, while this study found that engaging in online PB may help to reduce loneliness by increasing SWL, how that pans out remains to be known. The literature offers potential explanations, such as how online AB may foster positive social interactions, and future studies can test these assumptions. Finally, our study focused on Singapore and our sample focused on adult respondents—the mechanisms uncovered here may not necessarily apply to other age groups or other socio-political contexts. Still, despite these limitations, this current study hopes to contribute to a more nuanced understanding of the effects of IU on loneliness by accounting for the types of Internet behaviors that people engage in, exerting varying effects on their subjective well-being.

Theories seeking to explain loneliness have explicated its definitional components, such as its affective and social dimensions (e.g., Weiss, 1973) and studies have tested various individual and social factors that may contribute to loneliness (e.g., F. Müller et al., 2021). But as more and more people spend more time on the Internet, it is important for theorizing in this area to also account for not only IU frequency as a factor that may lead to loneliness but also the different types of behaviors that individuals engage in while on the Internet, as they may exert differential effects on our well-being. Doing so can help us to better design interventions to prevent or mitigate loneliness, such as encouraging certain types of Internet behaviors over others. Individuals may also learn from such work by becoming more self-aware of the potential consequences of their online activities for their well-being. This exploratory study sought to contribute to these efforts by proposing and testing a theoretical model that seeks to explain Internet-induced loneliness by considering the impact of engaging in online prosocial and antisocial behaviors. In brief, this study finds that doing good for others online also does something good for the individual.

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