Understanding computer-mediated communication attributes and life satisfaction from the perspectives of uses and gratifications and self-determination

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Abstract

Based on the theories of uses and gratifications, and self-determination, we examined a model linking computer-mediated communication (CMC) attributes to psychological need satisfaction in online friendships and to life satisfaction in a sample of school-aged adolescents (N = 1572). Our findings suggest direct links between media orientations (i.e., attitude toward online relationship formation and Internet habit strength) and psychological need satisfaction in online friendships. We also reported direct links between online communication, online self-disclosure and psychological need satisfaction in online friendships, and also a direct link between psychological need satisfaction in online friendships and life satisfaction. Despite these direct links, online communication and online self-disclosure significantly mediated the link between attitude toward online relationship formation and psychological need satisfaction in online friendships. In this pattern of links, both mediators were equally strong. Online communication and online self-disclosure also significantly mediated the link between Internet habit strength and psychological need satisfaction in online friendships. For this pattern of links, both mediators differed significantly in strength. Online communication emerged as a stronger mediator than online self-disclosure. Our findings suggest that CMC attributes may serve as a new social milieu for adolescent subjective well-being.

1. Introduction: life satisfaction and CMC

Life satisfaction reflects an individual’s global and subjective evaluations of his or her quality of life (Diener, 2000). Such positive evaluations are linked to physical and mental health (Gilman & Huebner, 2003; Huebner, Valois, Paxton, & Drane, 2005; Pavot & Diener, 2008; Trzcinski & Holst, 2008), and such negative evaluations are linked to depression, frettfulness, and aggressive behaviors (Buelga, Musitu, Murgui, & Pons, 2008; Huebner & Gilman, 2004; Koivumaa-Honkanen, Kaprio, Honkanen, Viinamaki, & Koskenvuo, 2004; Swami et al., 2007). Despite numerous studies investigating adult life satisfaction, few studies have been examined adolescent life satisfaction (Gilman & Huebner, 2006; Huebner & Gilman, 2004). As children grow into adolescents, friendship is thought to be of greater importance, playing an indispensable role in enhancing adolescent life satisfaction (Allen, Evans, Hare, & Mikami, 2010; Coleman, 2010; Croson, 2008; Gilman & Huebner, 2006; Oberle, Schonert-Reichl, & Zumbrun, 2011; Suldo & Huebner, 2004). However, the study of adolescent life satisfaction has been limited to face-to-face friendships (Gilman & Huebner, 2003; Gilman & Huebner, 2006; Pavot & Diener, 2008). There is relatively limited evidence documenting the associations between computer-mediated friendships and life satisfaction (Subrahmanyan & Greenfield, 2008).

Computer-Mediated Communication (CMC), a form of communication transaction that occurs through the use of computer networks, has fast become a popular sphere for social interactions and its sphere of penetration continues to grow under the rubrics of ICT development and modernization (Baym, 2010; Sheldon, Abad, &
Indeed, the last few years have seen an exponential growth in the use of CMC among adolescents—as compared to other age groups, adolescents are more inclined to accept computer technology and they represent an active group of Internet communication (Allen et al., 2010; Baran & Davis, 2011; Subrahmanyam & Greenfield, 2008; Urista, Dong, & Day, 2009).

The unprecedented popularity of CMC has consequently fueled a growing academic concern with respect to its consequences. While research has found that there are potential positive consequences, most of the available studies seem to adopt a negative, or even dystopian perspective, focusing on the adverse effects of CMC use (Chou & Peng, 2007; Engelberg & Sjöberg, 2004; Kraut et al., 1998; Morahan-Martin, 2008). This left the positive impact of the CMC attributes on adolescent life satisfaction open to speculation. Even if critics held the diffusion of CMC, recent years have witnessed that the young users are, nevertheless, not declining, but sharply rising worldwide (Lenhart, Purcell, Smith, & Zickuhr, 2010). As posited by McLeod (2007), it may be that CMC can potentially provide some pleasure or psychological benefits for its users. Indeed, many adolescents enjoy making online friends and they regarded such online relationships as real, deep, and meaningful (Bargh & McKenna, 2004; Leung, 2011; McKenna, Green, & Gleason, 2002; Subrahmanyam & Smail, 2011). This has led to our interest in investigating adolescent life satisfaction from the lens of CMC attributes since CMC, similar to the physical context, could be a place that fosters friendships.

2. Theoretical grounding

The study of interconnection between CMC attributes and life satisfaction draws upon the theories of uses and gratification, and self-determination. According to uses and gratifications theory (UGT), media use is one's goal-directed, purposive, and motivated actions in pursuit of needs and wants (Katz, Blumler, & Gurevitch, 1974). However, Rubin (2002) argued that users may not always be mindful in their media use, but sometimes habitual. Rubin (2002) therefore classified media orientation into two types: (a) instrumental orientation, one’s intention to use media for relationship formation (henceforth referred to attitude toward online relationship formation) and (b) ritualized orientation (henceforth referred to Internet habit strength), one’s nonselective decision to use media for diversionary motives. Rubin (2002) also noted that these two media orientations could play a role in promoting media behaviors such as online communication and online self-disclosure. In the present study, we focus on these two online media orientations in the relation to psychological need satisfaction in friendships.

Uses and gratifications theory per se is not sufficient to provide a full understanding of one's uses and gratifications stemming from his or her media use (Ko, Cho, & Roberts, 2005; Ryan, Rigby, & Przybylski, 2006). Deci and Ryan's (1985) self-determination theory (SDT) lends further support to the premise that psychological need satisfaction could be replicated in virtual context. According to Deci and Ryan (1985), Deci and Ryan (2000, Deci and Ryan (2002, Deci and Ryan (2008), there are three types of psychological need satisfaction: (a) autonomy, the need to act freely in favor of one's own volition, will or choice, (b) competence, the need to perform successful social interactions with skills and ability, and (c) relatedness, the need to establish positive emotional attachment with others. SDT proponents noted these three types of psychological need satisfaction represent one's universal acquisition which is automatically responsive to social context (Jang, Reeve, Ryan, & Kim, 2009; Lynch, La Guardia, & Ryan, 2009; Vansteenkiste, Lens, Soenens, & Luyckx, 2006). If one's social context is supportive of meaningful relationships, he or she will experience a heightened sense of psychological need satisfaction.

Psychological need satisfaction could be fostered through social interactions and relationships. A number of studies have indicated that adolescents are bound to make new friends online (Allen et al., 2010; Baran & Davis, 2011). Analogous to face-to-face encounters, CMC plays an equally important role in forming relationships (henceforth referred to online friendships) resulting from its meaningful conversations among users in cyber context (Ellison, Steinfield, & Lampe, 2007; McKenna et al., 2002; Sheldon et al., 2011; Urista et al., 2009). It appears that online friendship could hold implications for adolescent psychological need satisfaction. From the perspective of SDT, satisfaction of psychological needs is predictive of life satisfaction (Deci & Ryan, 1985; Deci & Ryan, 2002; Deci & Ryan, 2008). Thus, in the present study, we examined the role of psychological need satisfaction in online friendships in the prediction of life satisfaction with an UGT-SDT-based model.

2.1. Conceptual rationale and hypotheses

With attitude toward online relationship formation and Internet habit strength as media orientations and online communication and online self-disclosure as mediators, we hypothesized a model linking CMC attributes to psychological need satisfaction in online friendships and to life satisfaction (see Fig. 1).

2.1.1. From psychological need satisfaction in online friendships to life satisfaction

Psychological need satisfaction has been shown to play a central role in the study of life satisfaction (Deci & Ryan, 2000; Deci & Ryan, 2008). Extant evidence has been found from individualistic (e.g., the United States; Şimşek & Koydemir, 2013, Belgium; Luyckx, Vansteenkiste, Goossens, & Duriez, 2009) to collectivistic cultures (e.g., South Korea; Jang et al., 2009, Russia; Lynch et al., 2009, and China; Vansteenkiste et al., 2006) from interpersonal (Sheldon & Gunz, 2009) to intra-individual levels (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000), and from personal (La Guardia & Patrick, 2008; Patrick, Knee, Canevello, & Lonsbary, 2007) to public domains (Deci et al., 2001; Filak & Sheldon, 2008; Leversen, Danielsen, Birkeland, & Samdal, 2012; Lonsdale, Hodge, & Rose, 2009).

The expansion of CMC provides attractive platforms for social connection (Baym, 2010; Walther & Parks, 2002) and affords opportunities for need fulfillment (Sheldon et al., 2011; Walther, 2011). With respect to social connection, CMC allows individuals to make friends outside their physical social circle (Subrahanyam & Smail, 2011; Urista et al., 2009) and to foster social capital (Ellison et al., 2007). Indeed, McKenna et al. (2002) reported that Internet friendship gained from newsgroup could bring into real life. In Sheldon et al.'s (2011) longitudinal study, young active Facebook users reportedly showed higher levels of relatedness, one major type of psychological need satisfaction, as compared to non-Facebook users. With respect to need fulfillment, Walther (1992) noted that CMC users can easily gain a sense of autonomy following their high levels of self-expression in an anonymous platform. In some extent, CMC offers ample opportunities for its users to channel out their personal views and opinions (McKenna et al., 2002) and to receive verification for their own feelings, thoughts, and actions without a feeling of humiliation or criticism (Livingstone, 2008). Further, CMC may also provide a platform for its young users to learn communication skills (Notley (2008) and to gain social competency (Suler, 2003; Valkenburg & Peter, 2008). Based on research reviewed thus far, we formulated the following hypothesis:
H1. Psychological need satisfaction in online friendships would positively predict life satisfaction.

2.1.2. From media orientations to psychological need satisfaction in online friendships

In the present study, we focus on two media orientations. One is attitude toward online relationship formation, the other being Internet habit strength. Firstly, attitude toward online relationship formation, as first described by Atrill and Jalil (2011), refers to the extent of one’s favorability to form a relationship with other users via CMC. Existing studies reported positive associations between attitude toward CMC and satisfaction. In Lenhart et al. (2010) study, the authors reported that online activities are of personal choice and could be driven by intrinsic motivation such as attitude toward CMC. Likewise, Luo (2002) documented that e-satisfaction was largely predicted by positive attitude toward the web. A recent study by Ledbetter et al. (2011) reported that positive attitude toward online networks significantly predicted need satisfaction and relational closeness. The second hypothesis thus examines this proposition:

H2. Attitude toward online relationship formation would positively predict psychological need satisfaction in online friendships.

Secondly, Internet habit strength represents a form of automaticity or ritualistic manner in Internet consumption (LaRose & Eastin, 2004; Wohl, 2012) and is predictive of psychological need satisfaction. Inevitably, Internet represents an essential part of our daily activities and its use is habitual and routine (Horrigan, 2008; LaRose & Eastin, 2004; Lenhart et al., 2010; Wohl, 2012). To this end, several UGT scholars noted that Internet-based technologies could elicit cognitive, social, and effective gratifications (Katz et al., 1974; Rubin, 2002; West & Turner, 2009). For example, in Limayem, Hirt, and Cheung’s (2007) and Oulasvirta, Rattenbury, Ma, and Raita’s (2012) study, habitual experiences of repetitive Internet use were significantly predicted psychological need satisfaction. In line with these findings, our third hypothesis states the following:

H3. Internet habit strength would positively predict psychological need satisfaction in online friendships.

2.1.3. From online communication and online self-disclosure to psychological need satisfaction in online friendships

Online communication quantifies one’s frequency and duration of contact with his or her online counterparts (Bonetti, Campbell, & Gilmore, 2010) and is another determinant of psychological need fulfillment. In one study, Ryan et al. (2006) reported that time spent on online games could provide a supplementary way to achieve psychological need satisfaction. Likewise, Valkenburg and Peter (2007) reported a positive link between online communication and level of closeness in terms of friendships. Using a sample of 626 students aged from 10 to 16 years old, Bonetti et al. (2010) found that time spent for online communication is useful for identity exploration, social interactions, and self-disclosure. In a recent study, Sheldon et al. (2011) likewise reported a positive link between time spent for Facebook use and level of social connection. Taken together, it is apparent that online communication could exert its positive effects on the achievement of psychological needs. We hypothesize the following:

H4. Online communication would positively predict psychological need satisfaction in online friendships.

Online self-disclosure represents one’s deliberate intention to reveal himself or herself in pursuit of trust and intimacy through the Internet (Schouten, Valkenburg, & Peter, 2007). CMC provides a secure environment, hence, young users prefer online disclosure over face-to-face communication (Gibbs, Ellison, & Heino, 2006; Joinson & Paine, 2007; Mazer, Murphy, & Simonds, 2007; McKenna et al., 2002; Schouten et al., 2007; Sheeks & Birchmeier, 2007; Suler, 2003; Walther, 2011). For example, in a longitudinal study by McKenna et al. (2002), online self-disclosure predicted close, stable, and meaningful relationships after 2 years. It is possible that personal information sharing through a potential virtual relationship may satisfy one’s longing for emotional needs (Barak & Gluck-Ofri, 2007; Baym, 2010; Park, Jin, & Jin, 2011). As such, the following hypothesis was investigated:

H5. Online self-disclosure would positively predict psychological need satisfaction in online friendships.

2.1.4. Online communication and online self-disclosure as mediators

In addition to the direct effects of CMC attributes on psychological need satisfaction in online friendships, this study also examined the mediating role of online communication and online self-disclosure in the links between attitude toward online relationship formation and psychological need satisfaction in online friendships. Our premise was supported by research studies postulating that if users have positive attitude toward online relationship formation, their psychological need satisfaction could be achieved through their time spent in cyberspace and their sharing of personal and emotional thoughts (Atrill & Jalil, 2011; Bargh &
McKenna, 2004; Bonetti et al., 2010; Chen & Wels, 1999; Ellison et al., 2007; Erdoğan, 2008; Lenhart et al., 2010; Leung, 2011; McKenna et al., 2002; Schouten et al., 2007; Valkenburg & Peter, 2007). Therefore, we put forward our sixth hypothesis:

H6a. Online communication and online self-disclosure would mediate the links between attitude toward online relationship formation and psychological need satisfaction in online friendships.

The links between internet habit strength and psychological need satisfaction in online friendships would be also mediated by online communication and online self-disclosure. Our premise is again based on existing research showing that habitual experiences serve as a precursor of online behavior (e.g., Aarts & Dijksterhuis, 2000; LaRose & Eastin, 2004; Verplanken & Aarts, 1999). Such daily repetitive online behaviors could be reinforced through time devoted for communication and self-disclosure (Lenhart et al., 2010; Oulasvirta et al., 2012; Schouten et al., 2007; Wohl, 2012). In turn, accomplishment of psychological need satisfaction on cyberspace could be met (Baym, 2010). Hence, we put forward the following hypothesis:

H6b. Online communication and online self-disclosure would mediate the links between Internet habit strength and psychological need satisfaction in online friendships.

3. Method

3.1. Participants

A total of 1604 adolescents in twenty secondary schools were randomly selected with a stratified multistage random cluster sampling technique. In Stage 1, we clustered 5 geographic areas spanning from peninsular Malaysia to Borneo Island. Next, we randomly selected one participating state from each geographic zone via lottery method. In Stage 2, we clustered each participating state into districts. Next, we randomly picked two districts from each participating state. In Stage 3, we selected 20 participating schools from 10 selected districts with lottery method. These participating schools were stratified by location (10 urban schools and 10 rural schools). In Stage 4, we randomly picked Forms 1 (Grade 8), 2 (Grade 9), and 4 (Grade 11) students from each participating school. Data analysis included 1572 participants (899 females, 673 males) with no missing data. Participants’ age ranged from 13 to 18 years old (M = 15.05, SD = 1.08). There were 840 urban and 732 rural participants. Ethnic composition of the present sample consisted of 39.1% Malay (n = 614), 38% Chinese (n = 600), 6.7% Indian (n = 106), and 16.0% listed as other (n = 252).

3.2. Procedures

Participation was strictly voluntary and all potential participants were informed that they could refuse participation at any time. After informed consent had been sought, we gave participants a questionnaire and asked them to complete it after 30 min. To increase readability, we translated all measures into Malay language, the national language of Malaysia, using Brislin’s method (Willigerodt, Kataoka-Yahiro, Kim, & Ceria, 2005). All translated measures were pretested using a sample of 47 students. These translated measures achieved good psychometric properties (alpha > .70) with alphas ranging from .76 to .91, except for the Attitude toward Online Relationship Formation Scale (AORFS; alpha = .64). The original AORFS consists of 15 items which measuring participants’ inclination toward online relationship formation. A total score could be computed by summing six positive and nine negative items. However, a mixture of positive and negative items could sacrifice reliability and validity (Barnette, 2000). Lai’s (1994) also pointed that it is sufficient to measure construct validity with only positive items. Following Barnette’s (2000) and Lai’s (1994) recommendations, we removed all negative items. When this was done, a stable single solution was obtained (alpha = .81). In this regard, we used only six positive items for data collection.

3.3. Measures

As mentioned above, participants’ attitude toward online relationship formation was measured via the AORFS-Modified Version (Attrill & Jail, 2011). Participants rated six items on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Internal consistency reliability estimate was .76 in the present sample.

In the present study, participants’ Internet habit strength was assessed by LaRose and Eastin’s (2004) Habit Strength Scale. Participants rated three items on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Internal consistency reliability estimate was .79 in the present sample.

Participants’ online communication in terms of frequency and duration was measured via the Online Communication Questionnaire Modified Version (Bonetti et al.’s, 2010). For frequency items, participants rated one item on a 5-point Likert scale ranging from 0 (none) to 4 (everyday). For duration items, participants rated three items on a 5-point Likert scale ranging from 1 (less than 15 min) to 5 (more than 4 h). The raw scores were transformed to z-scores for data analysis. Internal consistency reliability estimate was .86 in the present sample.

In the present study, online self-disclosure was measured via Schouten et al.’s (2007) Online Intimate Self-Disclosure Scale, a 2 × 7-item that assesses participants’ self-disclosure to both sexes. Participants rated seven items on a 5-point Likert scale ranging from 1 (I tell nothing about this) to 5 (I tell everything about this). Following Schouten et al. (2007), raw scores from online self-disclosure to boys and online self-disclosure to girls could be combined to form a composite score of online self-disclosure. In the present study, internal consistency reliability estimates were .87 for disclosure to boys, .87 for disclosure to girls, and .88 for online self-disclosure.

In the present study, participants’ psychological need satisfaction in friendships was measured by the Need Satisfaction in Relationship Scale (La Guardia, Ryan, Couchman, & Deci, 2000), a 9-item inventory designed to assesses three psychological needs (i.e., autonomy, competence, and relatedness) from diverse attachment figures (e.g., mother, father, romantic partner, best friend, roommate, and significant adult). For the purposes of this study, we used online friend(s) as attachment figure. Participants rated nine items on a 7-point Likert scale ranging from 1 (not true at all) to 7 (very true). In the present sample, internal consistency reliability estimates were .66 for autonomy, .74 for competence, .75 for relatedness, and .87 for psychological need satisfaction.

In the present study, participants’ life satisfaction was measured via Diener, Emmons, Larsen, and Griffin’s (1985) Satisfaction with Life Scale. Participants rated five items on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Internal consistency reliability estimate was .71 in the present sample.

3.4. Data analysis

We completed data analysis with Analysis of Moment Structure (AMOS Version 18). Structural equation modeling (SEM: Bollen, 1989) with maximum likelihood estimation was performed to
examine our hypothesized model. As suggested by Browne and Cudeck (1993), our model was evaluated using the following criteria: (1) the comparative fit index (CFI); a value of .90 or more is suggestive of good fit; (2) the Tucker-Lewis index (TLI); a value of .90 or more is suggestive of good fit; (3) the root mean square error of approximation (RMSEA); a value of .08 or less is suggestive of acceptable fit; and (4) the standardized root mean square residual (SRMR); a value of .08 or less is suggestive of acceptable fit. It is important to note that \( \chi^2 \) estimate is easily affected by large sample size (\( N > 200 \)). In this regard, we used chi-square to degrees of freedom ratio (a value of 5 or less is suggestive of acceptable fit, Bollen, 1989). To further assess whether the indirect/mediated effects are statistically significant, Preacher and Hayes (2008) suggested Bootstrapping procedure (\( n = 5000 \), a resampling method which could generate the 95% bias-corrected confidence intervals (CIs). If the CIs do not include zero (\( p < .05 \)), we can conclude that the mediated effects are statistically significant (Preacher & Hayes, 2008). For the sake of statistical power and accuracy of Type I error (Shrout & Bolger, 2002), in the present study, we assessed mediation effect with Bootstrapping procedure.

### 4. Results

#### 4.1. Descriptive statistic, zero-order correlations, and internal consistency reliability estimates

Table 1 presents descriptive statistics, zero-order correlations, and internal consistency reliability estimates for the variables in the analysis. Inspections of skewness and kurtosis indices revealed that normality assumption was met for all study variables (Tabachnick & Fidell, 2013). All correlations among study variables were in the expected directions and statistically significant. Attitude toward online relationship formation was positively correlated with psychological need satisfaction in online friendships, all items from their respective scales were aggregated into parcel indicators using internal-consistency approach, also known as factor-based unidimensional parcel (see Little, Cunningham, Shahar, & Widaman, 2002, for reviews). When this was done, our measurement model had a good fit to the data, \( \chi^2 (215) = 822.68, \chi^2/df = 3.83, \text{CFI} = .95, \text{TLI} = .94, \text{RMSEA} = .04, 90\% \text{CI [.04, .05]}, \text{SRMR} = .04 \) (see Table 2). All the factor loadings for the indicators on the latent variables were statistically significant.

#### 4.2. Analysis of structural equation modeling

##### 4.2.1. Measurement model

We examined measurement model with confirmatory factor analysis. Our measurement model included 6 latent constructs and 23 indicator variables. To model two multidimensional latent variables for online self-disclosure and psychological need satisfaction in online friendships, all items from their respective scales were aggregated into parcel indicators using internal-consistency approach, also known as factor-based unidimensional parcel (see Little, Cunningham, Shahar, & Widaman, 2002, for reviews). When this was done, our measurement model had a good fit to the data, \( \chi^2 (220) = 883.47, \chi^2/df = 4.02, \text{CFI} = .94, \text{TLI} = .93, \text{RMSEA} = .04, 90\% \text{CI [.04, .05]}, \text{SRMR} = .05 \) (see Fig. 2). Psychological need satisfaction in online friendships was positively related to life satisfaction (\( \beta = .27, p < .001 \)), this providing support for H1. Next, attitude toward online relationship formation was positively related to psychological need satisfaction in online friendships (\( \beta = .31, p < .001 \)), thus providing support for H2. Positive links were also reported between attitude toward online relationship formation and online communication (\( \beta = .29, p < .001 \)), and online self-disclosure (\( \beta = .34, p < .001 \)). Internet habit strength was positively related to psychological need satisfaction in online friendships (\( \beta = .12, p < .001 \)), thus providing support for H3. Positive links were also reported between Internet habit strength and online communication (\( \beta = .29, p < .001 \)) and online self-disclosure (\( \beta = .15, p < .001 \)). Lastly, both online communication (\( \beta = .15, p < .001 \)) and online self-disclosure (\( \beta = .21, p < .001 \)) were positively related to psychological need satisfaction in online friendships, thus providing support for H4 and H5, respectively.

#### 4.3. Bootstrapping procedure

Table 3 displays the indirect effects and their associated 95% bias corrected bootstrapped CIs. With the inclusion online communication and online self-disclosure as mediators, the path

#### Table 1

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<td>.79</td>
<td>1.58</td>
<td>−.17</td>
<td>−.02</td>
<td>−.34</td>
<td>−.15</td>
<td>−.34</td>
<td>.08</td>
</tr>
</tbody>
</table>

Note: Atti = attitude toward online relationship formation, Habit = Internet habit strength, Com = online communication, Disclosure = online self-disclosure, NS = psychological need satisfaction, and LS = life satisfaction. Internal consistency reliability estimates (alpha) are on the diagonal where appropriate. \( * p < .001 \) (2-tailed).
Fit of measurement model.

<table>
<thead>
<tr>
<th>Latent variable</th>
<th>Indicators</th>
<th>Standardized loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude toward online relationship formation</td>
<td>Forming relationship</td>
<td>.49</td>
</tr>
<tr>
<td></td>
<td>Making new friends</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td>Nothing wrong</td>
<td>.41</td>
</tr>
<tr>
<td></td>
<td>Broaden</td>
<td>.62</td>
</tr>
<tr>
<td></td>
<td>Good arena</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td>Common practice</td>
<td>.34</td>
</tr>
<tr>
<td>Internet habit strength</td>
<td>Same time</td>
<td>.70</td>
</tr>
<tr>
<td></td>
<td>Usual routine</td>
<td>.84</td>
</tr>
<tr>
<td></td>
<td>Miss</td>
<td>.72</td>
</tr>
<tr>
<td>Online communication</td>
<td>Weekend</td>
<td>.86</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>.84</td>
</tr>
<tr>
<td></td>
<td>Last day</td>
<td>.84</td>
</tr>
<tr>
<td></td>
<td>Day</td>
<td>.58</td>
</tr>
<tr>
<td>Online self-disclosure</td>
<td>Girl</td>
<td>.56</td>
</tr>
<tr>
<td></td>
<td>Boy</td>
<td>.73</td>
</tr>
<tr>
<td>Psychological need satisfaction</td>
<td>Autonomy</td>
<td>.81</td>
</tr>
<tr>
<td></td>
<td>Competence</td>
<td>.81</td>
</tr>
<tr>
<td></td>
<td>Relatedness</td>
<td>.85</td>
</tr>
<tr>
<td>Life satisfaction</td>
<td>Change nothing</td>
<td>.37</td>
</tr>
<tr>
<td></td>
<td>Important things</td>
<td>.63</td>
</tr>
<tr>
<td></td>
<td>Satisfied</td>
<td>.76</td>
</tr>
<tr>
<td></td>
<td>Excellent</td>
<td>.73</td>
</tr>
<tr>
<td></td>
<td>Ideal</td>
<td>.54</td>
</tr>
</tbody>
</table>

Note: $\chi^2(215) = 822.68, p < .001$; $R^2$ (df = 3.83); Comparative Fit Index = .95; Tucker–Lewis Index = .94; Root Mean-Square Error of Approximation = .04; 90% confidence interval [.04, .05]; Standardized Root-Mean Square Residual = .04. $p < .001$.

toward online relationship formation and psychological need satisfaction in online friendships. Next, we compared the strength of mediation pertaining to these mediators (Preacher & Hayes, 2008). Effect contrast was .02 with 95% bias corrected bootstrapped CI [−.05, .09], suggesting that both mediators were equally strong.

With the inclusion of online communication and online self-disclosure as mediators, the path coefficient from Internet habit strength to psychological need satisfaction in online friendships was still significant ($c^2 = .48, p < .001$), thus supporting support for $H6a$. Total indirect effect was .28 with 95% bias corrected bootstrapped CI [.20, .36]. Both online communication ($ab = .19, p < .001, 95\%$ bias corrected bootstrapped CI [.13, .27]) and online self-disclosure ($ab = .09, p < .001, 95\%$ bias corrected bootstrapped CI [.04, .13]) emerged as significant mediators in the link between Internet habit strength and psychological need satisfaction in online friendships. Next, we compared the strength of mediation pertaining to these mediators. Effect contrast was .12 with 95% bias corrected bootstrapped CI [.04, .20], suggesting that both mediators were not equally strong. In particular, online communication emerged as a stronger mediator than online self-disclosure.

### 5. Discussion

This study was designed to examine a hypothesized model linking CMC attributes (attitude toward online relationship formation, Internet habit strength, online communication, online self-disclosure, and psychological need satisfaction in online friendships) to life satisfaction among adolescents. Extending previous research, our findings lend further support to UGT and SDT in CMC context. Our findings suggest a few direct links between CMC attributes and psychological need satisfaction in online friendships and also a direct link between psychological need satisfaction in online friendships and life satisfaction.

First, our findings indicate that psychological need satisfaction in online friendships was positively related to life satisfaction. Similar results were reported elsewhere (Deci & Ryan, 2000; Deci & Ryan, 2008; Jang et al., 2009; Lonsdale et al., 2009; Lynch et al., 2009; Patrick et al., 2007). It appears that need satisfaction is essential for promoting subjective well-being. Second, as hypothesized, attitude toward online relationship formation was
significantly and positively correlated with psychological need satisfaction in online friendships. This result suggests that participants who endorsed positive attitude toward online relationship formation tend to report higher levels of need satisfaction in online friendships. This result is consistent with previous studies documenting that attitude is predictive of need satisfaction in online context (Attrill & Jalil, 2011; Baran & Davis, 2011; Chen & Wells, 1999; Ledbetter et al., 2011; Luo, 2002). It is also important to note that one's perceived favorability in online relationship formation was also predictive of online communication and online self-disclosure among adolescents. One possible explanation is that adolescents adopt online communication and online self-disclosure as strategies to enhance online friendships resulting from their positive attitude toward online relationship formation (Attrill & Jalil, 2011; McKenna et al., 2002). Third, we also reported that Internet habit strength was positively associated with psychological need satisfaction in online friendships. This finding is in line with existing research (e.g., LaRose & Eastin, 2004). Online activities could transform into habitual routines, creating a reliable source of pleasure or reward (Ko et al., 2005; West & Turner, 2009). In this regard, Internet habit could be positively reinforced. Like attitude toward online relationship formation, Internet habit strength was also predictive of online communication and online self-disclosure among adolescents. One possible explanation is that habitual use of the Internet could create a perception that Internet is a good platform for online socialization (Lenhart et al., 2010; Limayem et al., 2007; Wohn, 2012). Forth, our findings also showed that online communication and online self-disclosure could lead to psychological need satisfaction in online friendships. Time spent for communication and self-disclosure are central components to establishing relationships (Baumeister & Leary, 1995; Duck & Mcmahan, 2011). Like physical social relationships, both online self-disclosure (Barak & Gluck-Ofri, 2007; Gibbs et al., 2006; Mazer et al., 2007) and online communication (Park et al., 2011; Subrahmanyam & Greenfield, 2008) could also offer psychological benefits such as feelings of acceptance, validation, and attachment.

Despite these direct links, one of our major findings is that attitude toward online relationship formation had a significant indirect effect on psychological need satisfaction in online friendships through online communication and online self-disclosure. A closer inspection revealed that the strengths of mediation pertaining to online communication and online self-disclosure were equally strong. In other words, both online communication and online self-disclosure are equally beneficial in promoting psychological need satisfaction in online friendships. One plausible explanation is that both online communication and self-disclosure lie on a single continuum with, and form part of, physical (Baumeister & Leary, 1995; Duck & Mcmahan, 2011) and online relationship (Valkenburg & Peter, 2007; Walther & Parks, 2002). As a hallmark of intimacy, one can develop a genuine social relationship through rich personal information sharing (Barak & Gluck-Ofri, 2007; Leung, 2011). With a reasonable amount of time to communicate effectively, CMC users can establish social relationship with their online partners (Duck & Mcmahan, 2011). Taken together, through self-disclosure and frequent interactions, such CMC users could be perceived by their counterparts as friendly. In turn, they gain social relatedness, a major component of psychological need satisfaction.

The link between Internet habit strength and psychological need satisfaction in online friendships was significantly mediated by online communication and online self-disclosure, another major finding of the present study. For this pattern of links, both mediaors online communication and online-disclosure, differed significantly in strength. The mediating effect via online communication was greater than via online self-disclosure. In other words, our findings suggest that increased Internet habit strength did not necessarily increase the extent of online self-disclosure to the same degree as it did for online communication. Internet habit strength promotes one's time spent in online communication rather than his or her degree of self-disclosure. One possible explanation is that CMC users do not actively making self-disclosure in view of their privacy concern (Subrahmanyam & Smahel, 2011). It is also possible that although habitual Internet users may frequently interact with online peers, they do not acquire any specified social needs (e.g., not interested in forming close and deep connections through CMC). Nevertheless, our findings lend support to LaRose and Eastin's (2004) and Wohn's (2012) notions that media habit plays a strong role in determining time allocation for Internet use.

5.1. Practical and methodological contributions

This study has several practical and methodological contributions. First, to contrast with the popular view that CMC is a dangerous conveyor of victimization, our results suggest that CMC can help gratify adolescent psychological needs and life satisfaction. Although causal inference is limited, one positive note is that CMC could offer opportunities for psychological need satisfaction, at least from the adolescents' points-of-view. Findings from this study are potentially useful for policy makers to reassess relevant social resources and opportunities in an attempt to promote social atmosphere for online friendship and adolescent subjective well-being.

Second, the present study's findings extend the theoretical gap by examining the psychological process pertaining to CMC attributes and life satisfaction in adolescents. From a developmental
perspective, friendships play more of a major role during adolescence than other developmental trajectories (Allen et al., 2010; Coleman, 2010; Crosnoe, 2000). Globally, platforms like Facebook afford flexibility and connections that support the mobility of the private sphere, which are potentially harmonious to contemporary modalities of friendships (Ellison et al., 2007; Petric, 2006). The present study is innovative by showing the view that online friendships could facilitate positive gains in psychological needs and adolescent life satisfaction. Although physical affiliation bases have great possibility to contribute to positive psychosocial development, it seems clear that adolescents' affiliation base also includes online friends. Practitioners need to be aware that physical relationships are not likely to be sufficient to fully address the needs of developing adolescents and their life satisfaction. Prevention and intervention programs need to go beyond the physical domain and focus on broader topics in cyber domains.

Third, the present findings further inform the roles of online communication and online self-disclosure in the promotion of psychological need satisfaction. As previously mentioned, CMC users make conscious effort for social connection through instrumental and ritualized media orientation; in turn, they show greater levels of satisfaction vis-à-vis online friendship and life. The flexibility and diversity of CMC allows its users to make their choices (Schouten et al., 2007; Valkenburg & Peter, 2007). In such instances, online communication and online self-disclosure may actually be discretionary in nature (Walther, 2011; West & Turner, 2009). Intervention programs could put greater attention in educating adolescents to make informed decision concerning the efficacy of online communication and the safety of online self-disclosure.

Finally, we used a sophisticated statistical procedure such as SEM to explore how CMC-related factors could differentially exert their effects on adolescents’ perception toward their lives. This multi-mediator analysis is one step further toward a better understanding of the psychological process of CMC attributes on life satisfaction, as opposed to single mediator analysis. The present findings clearly revealed that psychological need satisfaction in online friendships is not just an output, but also an input, i.e., it can potentially increase life satisfaction.

5.2. Limitations and future directions

While these contributions are novel, several limitations of this study must be considered. First, the present data were collected on a single occasion. Therefore, causal interpretations pertaining to the findings could not be made. To rigorously examine causal relations among study variables, experimental and longitudinal studies are recommended for future studies. Second, the use of self-reported measures may be subject to social desirability bias—participants provided socially acceptable responses only. Henceforth, it is useful to combine both quantitative (e.g., parent rating of online communication behaviors) and qualitative methods (e.g., actual observation of online communication behaviors). Finally, the present findings may not be generalizable to other age groups (e.g., children and adults). These age groups may have their unique developmental and psychological needs. Future research should test whether consistent findings could be obtained using different age groups.

6. Conclusion

In conclusion, the present study examined the beneficial effects of CMC attributes on adolescents’ subjective well-being. With both instrumental and ritualized media orientation strategies, adolescents form social connection in cyberspace; in turn, they experience higher levels of psychological need satisfaction in online friendships and satisfaction to their life. Our findings suggest that CMC attributes may serve as a new social milieu for adolescent subjective well-being. While more studies are needed to validate and refine the present findings, this study provides a great starting point for researchers.

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References


