



Motives for Texting During Early Adolescence

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OPEN ACCESS

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Specialty section:

This article was submitted to
Digital Impacts,
a section of the journal
Frontiers in Human Dynamics

Received: 03 September 2020

Accepted: 21 May 2021

Published: 15 June 2021

Citation:

Yau JC, McPartlan P and Reich SM
(2021) Motives for Texting During
Early Adolescence.
Front. Hum. Dyn 3:602368.
doi: 10.3389/fhumd.2021.602368

Research on adolescent texting has largely focused on whether the frequency of texting is associated with well-being. Whether the motives for texting is associated with well-being is not well known. We surveyed 130 young adolescents ($M_{\text{age}} = 12.41$ years) and identified user-clusters based on their motives for texting. We then examined whether the clusters were associated with phone habits that may affect health and learning (e.g., phone placement when sleeping). Participants were asked how often they texted someone when they were excited, proud, frustrated, angry, anxious, sad, needed help with homework, wanted to make plans, and needed advice [0 (never) to 4 (always)]. Using k-means clustering, we identified six clusters. On one end of the continuum were *Frequent-Texters* and *Positive-Frequent-Texters*. *Frequent-Texters* texted often for all purposes and *Positive-Frequent-Texters* frequently texted for all purposes except expressing negative emotions. On the other end of the continuum were *Selective-Texters* and *Positive-Selective-Texters*. *Selective-Texters* rarely texted for any reason and *Positive-Selective-Texters* rarely texted except for expressing positive emotions. In between were the *Moderate-Texters* and the *Positive-Practical-Moderate-Texters*. *Moderate-Texters* texted less frequently than *Frequent-Texters* and more frequently than *Selective-Texters* for all purposes. *Positive-Practical-Moderate-Texters* texted more frequently than *Moderate-Texters* for positive emotions and for practical reasons. Clusters differed by gender, texting experience, and Fear of Missing Out (FOMO). *Frequent-Texters* started texting at a marginally younger age than *Selective-Texters*, had high FOMO scores, and were all girls. Clusters also differed in their phone habits. For instance, when sleeping, *Frequent-Texters* were more likely than other groups to have their phones on or next to the bed. When doing homework, *Selective-Texters* were less likely to keep their phones on or near them. Interestingly, *Positive-Frequent-Texters* were more likely to have the ringer on or to have their phone on vibrate while doing homework, but not more likely to keep their phones nearby. Given that texting is a common communication method, it is important to understand the heterogeneity of reasons why youth text and how those reasons relate to phone habits.

Keywords: texting, sleep, adolescence, homework, cell phone

INTRODUCTION

Nearly 80% of adolescents in the United States report texting daily and a third say that texting is their preferred mode of communication with friends (Rideout and Robb, 2018; Rideout and Robb, 2019). Given the popularity of texting and messaging platforms, such as WhatsApp concerns have been raised about whether the amount of time texting and the number of texts sent can affect adolescents' health and academic achievement (e.g., Rosen et al., 2013). In one study, the number of daily texts sent and received was associated with negative outcomes such as sleep problems (Murdock, 2013). In another study, WhatsApp use was positively associated with well-being (Bano et al., 2019). However, a focus solely on the frequency of texting and not how, why, or with whom, treats texting as a homogeneous activity and does not capture the many ways in which it is used (e.g., making plans, joking, sexting; Lenhart et al., 2010; Harrison and Gilmore, 2012; O'Hara et al., 2014). It is possible that it is not only the amount of texts that affects youth's health and academic achievement, but also their motivations for use, which include specific needs (e.g., seeking advice) and emotional states (e.g., anger, excitement). The goal of this study, therefore, is to identify patterns of texting behavior based on adolescents' motivations for texting, and to examine how these patterns relate to Fear of Missing Out (FoMO; Przybylski et al., 2013), sleep, and schoolwork. A person-centered approach is used, as it enables the detection of groups, or clusters, of individuals whose texting behaviors are similar to those in their cluster but distinct from those of individuals in other clusters (Laursen and Hoff, 2006).

Texting, like other forms of media use, is goal oriented. According to the uses and gratifications theory, individuals use media in order to fulfill certain needs (Rubin, 2009). For young adults and adolescents, texting can be used for a variety of purposes such as discussing positive and negative events, showing affection, relaxing, coordinating offline activities, and discussing schoolwork (Jin and Park, 2010; Lenhart et al., 2010; Grellhesl and Punyanunt-Carter, 2012; Ehrenreich et al., 2020). It is possible that there are different patterns of texting use. For example, some adolescents may text to coordinate offline activities, but not to share about positive and negative emotions. Others may text for emotional support. Emotional experiences, both positive and negative, are often shared soon after they occur when they are most present in one's consciousness (Rimé et al., 1998). Given the preference for sharing immediately, for some adolescents, texting may be a valuable tool that facilitates rapid communication of emotional experiences (Vermeulen et al., 2017).

Studies conducted in Europe, Asia, and North America have explored characteristics of users (i.e., clusters) based on motivations for using social networking sites (SNS). Most of this research was conducted with adult participants. In a study of adult SNS users in Norway, five clusters were identified. The clusters were advanced users (i.e., used SNS frequently and for many purposes), debaters (i.e., used SNS to share content and to engage in discussions and debates), socializers (i.e., used SNS to interact with friends and family), lurkers (i.e., used SNS to pass the time and to browse through content that others shared), and

sporadics (i.e., used SNS only when others had contacted them; Brandtzæg, 2012). In a study of adult SNS users in Turkey, four clusters were identified: advanced users (i.e., used SNS for many purposes, especially to share content), business-oriented users (i.e., used SNS for business and to obtain information), communication seekers (i.e., used SNS to interact with friends and family and to obtain information), and dawdlers (i.e., used SNS for few purposes; Bulut and Doğan, 2017). Four clusters were also identified in a study of adult Facebook users in the United States: entertainment chasers (i.e., used Facebook for entertainment), attention seekers (i.e., used Facebook to share about their lives and to seek compliments from others), devotees (i.e., used Facebook for social support), and connection seekers (i.e., used Facebook to interact with friends they know offline; Hodis et al., 2015). While some of the clusters identified by these studies were unique to each study (e.g., business-oriented users), others, such as users who used SNS for many purposes, users who used SNS for few purposes, users who communicated with friends and family, and users who shared content, were identified by multiple studies.

Similar patterns of SNS use were identified in young adolescents. In a study of sixth-grade students in Taiwan, four clusters were identified: highly motivated (i.e., used SNS for many purposes), less motivated (i.e., used SNS for few purposes), relaxed oriented (i.e., used SNS to decrease stress and anxiety), and socially oriented (i.e., used SNS to stay in touch with family and friends, make new friends, share content, gain popularity, obtain information, and follow celebrities; Su et al., 2018). These studies demonstrate that SNS users can be categorized into clusters based on their motives for use and that many of these clusters exist across cultures and age groups.

The patterns of texting use are likely to differ from the patterns of SNS use, as the audiences and functions of these two platform types differ. SNS are perceived as semi-public spaces where profiles are crafted to appeal to a broad audience. Users may curate their profiles to appear well liked and attractive to a large network of friends and acquaintances (Yau and Reich, 2020) or to avoid negative perceptions from some members of their network. For example, LGBTQ users who have not identified as LGBTQ to their extended family may remove references to their sexual identity on their Facebook profiles for fear of marginalization (Duguay, 2016). Conversely, texting platforms are perceived as private spaces where adolescents can share details about their daily lives and disclose emotions with close friends (Yau and Reich, 2020). A recent study categorized adolescents according to their frequency of texting from early to late adolescence (Coyne et al., 2018). Four clusters were identified: perpetuals (i.e., high frequency throughout adolescence), decreaseers (i.e., high frequency during early adolescence, but low frequency during middle and late adolescence), moderates (i.e., low frequency throughout adolescence) and increaseers (i.e., low frequency during early adolescence, but high frequency during middle and late adolescence). These groups differed on measures of depression, anxiety, physical and relational aggression, relationships with their father and their friends, and problematic cell phone use, which was defined as excessive usage that interfered with school, work, and relationships. To

our knowledge, no studies have identified clusters based on motivations for texting. The first goal of this study, therefore, is to segment young adolescents (6–9th grade; $M_{\text{age}} = 12.41$) according to their motivations for texting and to identify differences in demographic characteristics, specifically gender, cell phone ownership, age at which they started texting, and FOMO, as FOMO is associated with problematic cell phone and social media use (Oberst et al., 2017; Franchina et al., 2018).

Research on other forms of media such as television, general cell phone use, and SNS suggest that motivations are associated with media habits. Individuals who binge-watch television and consider themselves television addicts are more likely to watch television to regulate their moods (e.g., when feeling lonely, anxious, frustrated, and bored; McIlwraith, 1998; Rubenking and Bracken, 2018). Similarly, high frequency cell phone users tend to use their phones for boredom relief (Lepp et al., 2016). Using SNS as a means of escape is also associated with greater SNS use and using SNS to develop and maintain friendships is associated with more frequent and greater SNS use (Cha, 2010). The amount and frequency of media use may, thus, depend on individuals' motivations.

Motivations for media use may also be associated with well-being. Individuals who primarily used SNS to interact with friends and family reported less loneliness (Brandtzæg, 2012), in addition to having more interactions and acquaintances offline. For individuals who used Facebook to make new friends and date, more time on Facebook was associated with depression, anxiety, and loss of behavioral and emotional control. Conversely, using Facebook to keep in touch with friends was associated with positive affect (Rae and Lonborg, 2015). Little is known, however, about whether motivations for texting relate to behaviors while sleeping and completing homework.

Adolescents' texting habits before bed and after they have fallen asleep are of concern, as nearly 60% of middle school students and 70% of high school students in the United States do not get the recommended amount of sleep (Wheaton et al., 2018). One habit that may affect the quantity and quality of adolescents' sleep is whether they leave the phone's ringer on. Over a third of adolescents reported waking up in the middle of the night to check their phone and among those, half cited that it was because they were awakened by notifications (Robb, 2019). Hearing and seeing notifications before bed and after sleep onset is also associated with sleep problems (Murdock et al., 2017; Murdock et al., 2019).

Another habit that may affect the quantity and quality of sleep is whether adolescents sleep with their cell phones on their beds. Over a quarter of adolescents and young adults sleep with their phones on their beds (Dowdell, 2019; Robb, 2019) and one study found that adolescents who slept with their phones nearby were more likely to be woken up by notifications (Adachi-Mejia et al., 2014). A study with college students, however, found that placing the phone on or near the bed was associated with fewer sleep problems (Rosen et al., 2016). Thus, our second goal is to understand how different behavior habits are associated with healthful phone behaviors during sleep (e.g., turning the ringer off, not sleeping with phone in or near the bed).

Phone habits, like leaving the ringer on and placing the phone nearby may also affect the quality or time required to complete homework. According to the memory for goals theory, when attention is shifted from one task to another, there is a lag when individuals resume the first task, as individuals must recall their progress before the interruption (Altmann and Trafton, 2005). This suggests that texting while working on homework may be disruptive because adolescents need to reorient themselves to the task every time they read or respond to a message. Sixty percent of adolescents report sometimes or often texting while doing homework (Common Sense Media, 2015). While most (64%) report that it does not affect the quality of their work (Common Sense Media, 2015), research suggests otherwise. It takes longer to read a passage when instant messaging concurrently (Chen and Yan, 2016). Moreover, when texting during a lecture, notes tend to be less complete and less is recalled (Chen and Yan, 2016). Simply receiving notifications is enough to impede performance in an attention demanding task (Stothart et al., 2015), suggesting that leaving the ringer on and placing the phone nearby, which alerts adolescents to notifications, may disrupt homework completion even if adolescents do not send messages. Thus, the third goal of our study is to explore how different texting clusters relate to distraction reducing behaviors such as turning the ringer off and not keeping phones nearby when working on homework.

In sum, the goals of our study are to identify whether young adolescent texters can be grouped into clusters based on their motivations for use and then to determine how these clusters differ in their tendencies to engage in recommended healthful phone behaviors, specifically when sleeping and completing homework.

MATERIALS AND METHODS

Participants

The data for this paper were gathered during a larger experimental study on whether texting a friend can improve mood and reduce stress after a stressful situation (Yau et al., 2020). Participants were recruited from afterschool programs and summer school classes and through snowball sampling. Our sample, which consisted of 130 young adolescents (51% female; $M_{\text{age}} = 12.41$, $SD = 1.23$; range 10–16 years) was ethnically diverse (32% Asian, 28% Latinx, 19% Multi-ethnic, 16% White, 5% other; see **Table 1**). Most participants owned a cell phone (85%) and of those, nearly all owned a smartphone (95%). The age at which participants started texting ranged from 7 to 14 years ($M = 10.35$, $SD = 1.35$) and the most popular texting platforms were the default texting app/iMessage (used by 83% of participants in the past week), Instagram Direct Message (43%), SnapChat (38%), in-game chat or Discord (36%), and Google Hangouts (33%). We did not ask participants to specify whether the platforms were used for one-to-one messaging or for group messaging. Since texting can be done through any wifi connected device, phone ownership was not a requirement for eligibility. After excluding one participant who decided not to include their data (their data was also excluded from the sample description

TABLE 1 | Cluster demographics.

			Selective Texters	Positive Selective Texters	Moderate Texters	Positive Practical Moderate Texters	Frequent Texters	Positive-Frequent-Texters	Total	Significance
Reasons for texting	Positive	M (SD)	0.50 (0.56)	2.82 (0.71)	1.85 (0.66)	2.81 (0.73)	3.60 (0.39)	3.32 (0.80)	2.50 (1.04)	—
	Negative elevated	—	0.11 (0.33)	1.18 (0.64)	1.10 (0.60)	2.19 (0.54)	3.30 (0.89)	1.00 (0.59)	1.54 (1.00)	—
	Negative depressed	—	0.06 (0.17)	1.03 (0.72)	1.21 (0.58)	1.95 (0.48)	3.35 (0.53)	1.58 (0.55)	1.54 (0.92)	—
	Practical	—	0.89 (0.49)	1.26 (0.73)	2.25 (0.64)	2.64 (0.66)	3.40 (0.61)	3.18 (0.46)	2.33 (0.95)	—
	Advice	—	0.11 (0.33)	0.59 (0.51)	1.68 (0.64)	2.24 (0.83)	3.70 (0.48)	3.43 (0.65)	1.95 (1.22)	—
Gender	Female	n	2	7	14	23	10	6	62	Fisher's exact = 0.003
		% of cluster	22%	41%	41%	62%	100%	43%	51%	
		Adjusted residual	-1.810	-0.895	-1.384	1.595	3.221	-0.667	—	
	Male	n	7	10	20	14	0	8	59	
		% of cluster	78%	59%	59%	38%	0%	57%	49%	
		Adjusted residual	1.810	0.895	1.384	-1.595	-3.221	0.667	—	
Cell phone ownership	Yes	n	8	12	29	32	9	13	103	Fisher's exact = 0.673
		% of cluster	89%	71%	85%	86%	90%	93%	85%	
		Adjusted residual	0.330	-1.817	0.033	0.28	0.452	0.865	—	
	No	n	1	5	5	5	1	1	18	
		% of cluster	11%	29%	15%	14%	10%	7%	15%	
		Adjusted residual	-0.330	1.817	-0.033	-0.28	-0.452	-0.865	—	
Age started texting	—	M (SD)	11.57 (0.79) ^a	9.82 (1.01) ^b	10.82 (1.26) ^{ab}	10.22 (1.12) ^{ab}	9.80 (1.55) ^{ab}	10.29 (1.86) ^{ab}	10.38 (SD = 1.34)	F (5, 111) = 3.17, p = 0.01
Fear of Missing Out	—	M (SD)	1.42 (0.25) ^a	1.96 (0.70) ^{ab}	1.79 (0.58) ^a	2.35 (0.53) ^b	3.01 (0.63) ^c	2.50 (0.52) ^{bc}	2.14 (SD = 0.69)	F (5, 111) = 12.84, p < 0.001
Total	—	—	9	17	34	37	10	14	121	—

Notes. For Reasons for Texting, range: 0 (never) – 4 (always). For Age Started Texting and Fear of Missing Out, mean values with the same superscript denote clusters that are not significantly different at the $p < 0.05$ level based on a Tukey's adjustment for multiple comparisons. (e.g., A cluster with the subscript "a" is significantly different from a cluster with the subscript "b," but NOT significantly different from another cluster with subscript "a." A cluster with the subscript "ab" is NOT significantly different from clusters with subscript "a" or "b.").

above) and eight participants with missing data, we were left with an analytic sample of 121.

Procedure

Adolescents were asked to come to the lab with a same-gender friend with whom they messaged at least once a week. As part of the larger study, participants were directed to separate rooms and both completed the Trier Social Stress Task, which was used to induce stress. Pairs were randomly assigned to message their friend, watch a video independently, or sit quietly for 5 min (see Yau et al., 2020). The data for this paper were drawn from a demographic survey that participants completed before the experiment and a survey about their media use that was completed after the experiment. The study received approval from the university's Institutional Review Board and both surveys were pilot-tested prior to use. Participants received two movie tickets each (valued at approximately \$20 USD) as compensation.

Measures

Reasons for Texting

On a scale of 0 (never) to 4 (always), participants indicated how frequently they texted someone when they were excited, proud, frustrated, angry, anxious, sad, needed help with homework, wanted to make plans, and needed advice (see **Supplementary Materials**). On average, participants messaged someone in order to express excitement ($M = 2.74$, $SD = 1.19$) and to make plans ($M = 2.58$, $SD = 1.22$) most frequently. Expressing anger ($M = 1.42$, $SD = 1.11$) and sadness ($M = 1.43$, $SD = 1.11$) were the least frequent.

Phone Habits

Participants were asked what mode their phone was usually in when they were sleeping and when they were doing homework (see **Supplementary Materials**). The options were 1) volume on, 2) vibrate, but the sound is turned off, 3) silent, but not on airplane mode, 4) do not disturb mode (calls and notifications are silenced), 5) airplane mode, and 6) turned off completely. For analysis, we categorized the responses based on the likelihood that participants would be aware of notifications. The responses "volume on" and "vibrate, but the sound is turned off" were combined as participants may hear and be alerted to notifications. The responses "silent, but not on airplane mode," "do not disturb mode," "airplane mode," and "turned off completely" were combined, as participants were choosing not to be disturbed by notifications. Participants were also asked where they typically placed their phone when they were sleeping and when they were doing homework (see **Supplementary Materials**). The options for phone placement during sleep were 1) on your bed, 2) next to your bed, 3) somewhere else in the room where you sleep, and 4) in a different room. The options for phone placement during homework were 1) in hand or pocket, 2) next to you, 3) somewhere else in the room, and 4) in a different room. The responses for phone placement were also categorized for analysis based on the likelihood that participants would be aware of notifications. As such, for phone placement during sleep, the responses "on bed" and "next to your bed" were combined and the responses "somewhere else in the room where you sleep" and

"in a different room" were combined. For homework, the options "in hand or pocket" and "next to you" were combined and "somewhere else in the room" and "in a different room" were combined.

Fear of Missing Out

The ten-item FOMO scale was used (Przybylski et al., 2013). Participants rated how true a series of statements (e.g., "I fear my friends have more rewarding experiences than me," "Sometimes, I wonder if I spend too much time keeping up with what is going on") were on a scale from 1 (not at all true of me) to 4 (extremely true of me). The mean of the ten items were then computed; $\alpha = 0.82$, $M = 2.14$, $SD = 0.69$.

Demographic Survey

The demographic survey consisted of questions about participants' gender, age, and ethnicity, as well as questions about cell phone ownership, age at which they started texting, and the texting platforms they use most frequently.

Analytic Plan

Before creating the clusters, we grouped the motives for texting into latent variables based on an exploratory factor analysis and subsequent comparisons of latent measurement models. We compared models in which the items loaded onto one, three, four, and five factors, respectively. We then conducted a difference in chi-square test among the competing models to determine which one provided the best balance of goodness-of-fit with parsimony.

After deciding on a factor structure, we conducted a k-means cluster analysis in Ropstat (Vargha et al., 2015). Consistent with the two-step procedure for exploratory cluster analysis, this was preceded by hierarchical clustering using Ward's method to first determine an appropriate number of clusters for a k-means analysis (e.g., Conley, 2012; Vargha et al., 2015). Solutions were generated containing two through fifteen clusters. A scree-like plot was then generated to visualize large changes in within-cluster homogeneity as clusters were collapsed (Wormington et al., 2012), with two relatively large jumps or "elbows" bookending a range of solutions from four to nine clusters that were statistically viable (see **Supplementary Materials** for elbow plot). From these options, we used theoretical considerations to select a final solution that best balanced parsimony, within-cluster homogeneity, and between-cluster heterogeneity. Our final k-means analysis used the centroids generated from the chosen solution of hierarchical clustering. To identify differences in demographics between the clusters, Fisher's exact test and ANOVA were used. Fisher's exact test was used to identify gender and cell phone ownership differences as the expected values for more than 20% of the cells were less than five (Kim, 2017). ANOVA with Tukey's post-hoc test was used to identify differences in FOMO and the age at which they started texting.

To determine differences between clusters in likelihood of engaging in risky cell phone habits when sleeping and doing homework, we used Fisher's exact test. We restricted these analyses to participants who owned a cell phone.



RESULTS

The factor analyses that were conducted to group the texting motives into latent variables showed that the five-factor model fit the data significantly better than each of the other models. The resulting factors were positive (i.e., “you are excited about something,” “you are proud of something you did), negative elevated (i.e., “you feel frustrated about something,” “you feel angry about something”), negative depressed (i.e., “you feel anxious about something,” “you feel sad about something”), practical (i.e., “you need help with homework, you want to make plans”), and advice (“you need advice”).

RQ1: Texting Use Clusters

Using these five factors, we then identified six clusters of texters based on young adolescents’ motives for texting: Selective-Texters (i.e., texted infrequently for all reasons), Positive-Selective-Texters (i.e., texted infrequently except for sharing positive emotions), Moderate-Texters (i.e., texted more frequently than Selective-Texters, but less frequently than Positive-Practical-Moderate-Texters and Frequent-Texters across all reasons), Positive-Practical-Moderate-Texters (i.e., texted more frequently than Moderate-Texters for sharing positive emotions and for practical reasons, but less frequently than Frequent-Texters for all reasons), Frequent-Texters (i.e., frequently texted for all reasons), and Positive-Frequent-

Texters (i.e., frequently texted for all reasons except to share negative emotions; see **Figure 1**). Adolescents in some of the clusters endorsed all motives equally. For example, Frequent-Texters frequently texted to express positive emotions, negative elevated emotions, negative depressed emotions, for practical reasons, and for asking for advice. Adolescents in other clusters, however, endorsed some motives more than others. For example, Positive-Frequent-Texters often texted for expressing positive emotions, for practical reasons, and for asking for advice, but less frequently for expressing negative emotions.

The clusters differed by gender (Fisher's exact, $p = 0.003$), the age at which they started texting, ($F(5,111) = 3.17, p = 0.01$), and FOMO scores ($F(5, 115) = 12.84, p < 0.001$; **Table 1**). However, there were no differences across clusters in cell phone ownership (Fisher's exact, $p = 0.673$).

Selective-Texters

The Selective-Texter cluster ($n = 9, 7\%$ of sample) rarely used texting for expressing positive emotions ($M = 0.50, SD = 0.56$), expressing negative elevated emotions ($M = 0.11, SD = 0.33$), expressing negative depressed emotions ($M = 0.06, SD = 0.17$), practical reasons ($M = 0.89, SD = 0.49$), or asking advice ($M = 0.11, SD = 0.33$). Selective-Texters tended to start texting later ($M = 11.57$ years, $SD = 0.79$) than Positive-Selective-Texters ($M = 9.82, SD = 1.01$), $p = 0.034$, and marginally later than Frequent-Texters ($M = 9.80, SD = 1.55$), $p = 0.063$. Selective-Texters were also characterized by low FOMO scores ($M = 1.42, SD = 0.25$).

Positive-Selective-Texters

Like Selective-Texters, Positive-Selective-Texters ($n = 17, 14\%$ of sample) rarely used texting for expressing negative elevated emotions ($M = 1.18, SD = 0.64$), negative depressed emotions ($M = 1.03, SD = 0.72$), practical reasons ($M = 1.26, SD = 0.73$), or asking advice ($M = 0.59, SD = 0.51$). However, Positive-Selective-Texters did use texting to express positive emotions ($M = 2.82, SD = 0.71$). Positive-Selective-Texters ($M = 1.96, SD = 0.70$) had significantly lower FOMO scores than Frequent-Texters and marginally lower scores than Positive-Frequent-Texters. Their FOMO scores did not differ from Selective-Texters and Moderate-Texters.

Moderate-Texters

Moderate-Texters ($n = 37, 31\%$ of sample) endorsed all of the reasons for texting more frequently than Selective-Texters: expressing positive emotions ($M = 1.85, SD = 0.66$), expressing negative elevated emotions ($M = 1.10, SD = 0.60$), expressing negative depressed emotions ($M = 1.21, SD = 0.58$), for practical reasons ($M = 2.25, SD = 0.64$), and asking advice ($M = 1.68, SD = 0.64$). Moderate-Texters ($M = 1.79, SD = 0.58$) had significantly lower FOMO scores, on average, than Positive-Practical-Moderate-Texters and Positive-Frequent-Texters.

Positive-Practical-Moderate-Texters

Positive-Practical-Moderate-Texters ($n = 34, 28\%$ of sample) texted more frequently than Moderate-Texters for sharing positive emotions and for practical reasons and less

frequently than Frequent-Texters for all purposes: expressing positive emotions ($M = 2.81, SD = 0.73$), expressing negative elevated emotions ($M = 2.19, SD = 0.54$), expressing negative depressed emotions ($M = 1.95, SD = 0.48$), practical reasons ($M = 2.64, SD = 0.66$), and asking for advice ($M = 2.24, SD = 0.83$). On average, FOMO scores for Positive-Practical-Moderate-Texters ($M = 2.36, SD = 0.53$) were higher than those of Selective-Texters and Moderate-Texters, but lower than those of Frequent-Texters.

Frequent-Texters

Frequent-Texters ($n = 10, 8\%$ of sample) often texted for expressing positive emotions ($M = 3.60, SD = 0.39$), expressing negative elevated emotions ($M = 3.30, SD = 0.89$), expressing negative depressed emotions ($M = 3.35, SD = 0.53$), practical reasons ($M = 3.40, SD = 0.61$), and asking for advice ($M = 3.70, SD = 0.48$). Frequent-Texters were all girls (adjusted residual = 3.22), who started texting at an early age ($M = 9.80$ years, $SD = 1.55$) and had high FOMO scores ($M = 3.01, SD = 0.63$). They started texting marginally earlier than Selective-Texters and their FOMO scores were, on average, significantly higher than Selective-Texters, Positive-Selective-Texters, Moderate-Texters, and Positive-Practical-Moderate-Texters.

Positive-Frequent-Texters

Participants in the Positive-Frequent-Texter cluster ($n = 14, 12\%$ of sample) often used texting for expressing positive emotions ($M = 3.32, SD = 0.80$), for practical reasons ($M = 3.18, SD = 0.46$), and for asking advice ($M = 3.43, SD = 0.65$). Unlike the Frequent-Texters, they rarely used texts for expressing negative elevated emotions ($M = 1.00, SD = 0.59$) or for expressing negative depressed emotions ($M = 1.58, SD = 0.55$). Positive-Frequent-Texters ($M = 2.50, SD = 0.52$) had higher FOMO scores than Selective-Texters and Moderate-Texters and marginally higher scores than Positive-Selective-Texters.

RQ2: Differences in Cell Phone Habits During Sleep Cell Phone Mode

Among participants with their own cell phone, less than half left the ringer on (17%) or put their phones on vibrate (29%) while they slept. It was more common for participants to silence their phones: 18% on silent, 17% turned off completely, 12% on airplane mode, and 8% on do not disturb. There were no differences between clusters in the tendency to leave the ringer on during sleep (Fisher's exact, $p = 0.618$) or to have the ringer or vibrate mode on (Fisher's exact, $p = 0.524$, **Table 2**).

Cell Phone Location

Over 40% of participants kept their cell phone on or near their bed. Eleven percent kept their phone on the bed and 32% kept their phone near the bed. A quarter of participants kept their phone somewhere else in the room and 31% kept their phone in a different room. There were differences

TABLE 2 | Cell phone habits during sleep.

			Selective Texters	Positive Selective Texters	Moderate Texters	Positive Practical Moderate Texters	Frequent Texters	Positive-Frequent-Texters	Total	Significance
Mode	Ringer or vibrate on	n	3	4	16	15	2	7	47	Fisher's exact = 0.524
		% of cluster	38%	33%	55%	47%	22%	54%	46%	
		Adjusted residual	-0.481	-0.910	1.217	0.170	-1.476	0.636	—	
	Ringer and vibrate off	n	5	8	13	17	7	6	56	Fisher's exact = 0.029
		% of cluster	63%	67%	45%	53%	78%	46%	54%	
		Adjusted residual	0.481	0.910	-1.217	-0.170	1.476	-0.636	—	
Location	On or near bed	n	3	6	14	10	8	3	59	Fisher's exact = 0.029
		% of cluster	38%	50%	48%	31%	89%	23%	57%	
		Adjusted residual	-0.311	0.542	0.714	-1.580	2.931	-1.532	—	
	Not on or near bed	n	5	6	15	22	1	10	44	Fisher's exact = 0.029
		% of cluster	63%	50%	52%	69%	11%	77%	43%	
		Adjusted residual	0.311	-0.542	-0.714	1.580	-2.931	1.532	—	
Total	—	—	8	12	29	32	9	13	103	—

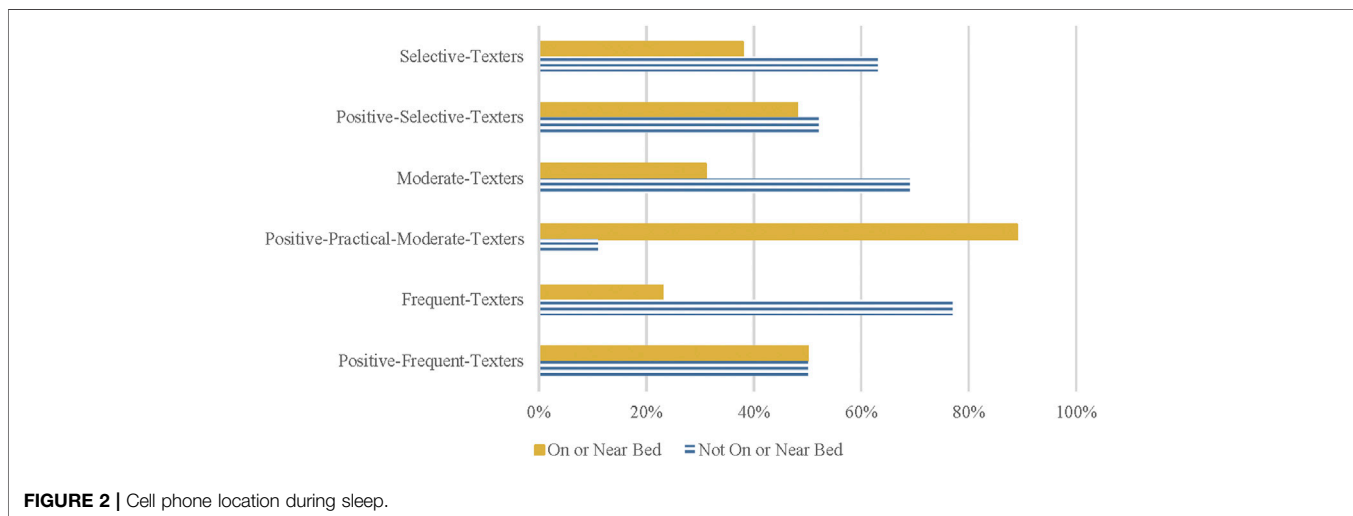


FIGURE 2 | Cell phone location during sleep.

between clusters in the likelihood of keeping their cell phone on or next to their beds (Fisher’s exact, $p = 0.029$, **Table 2** and **Figure 2**). All but one Frequent-Texter kept her cell phone on or next to her bed (adjusted residual = 2.93).

RQ3: Differences in Cell Phone Habits When Completing Homework

Cell Phone Mode

Nearly a quarter of participants with their own cell phone kept the ringer on (23%) when they did their homework and half (51%) put their phone on vibrate mode. Silencing their phones during

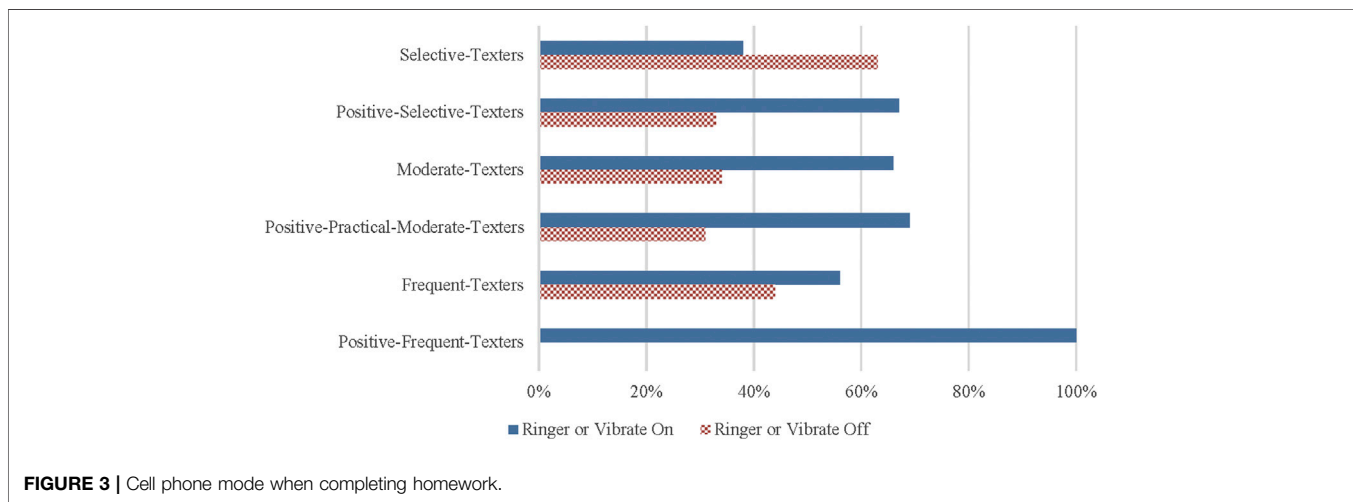
homework time was much less common: 13% on silent, 8% on airplane mode, 4% turned off completely, and 1% on do not disturb. However, the clusters differed in their likelihood of having the ringer on or putting their phone on vibrate (Fisher’s exact, $p = 0.036$, **Table 3** and **Figure 3**). All Positive-Frequent-Texters left the ringer on or had their phone on vibrate (adjusted residual = 2.65).

Cell Phone Location

Many participants kept their phone near them while they did their homework: 13% in their hand or pocket and 50% next to them. There were also differences between clusters in their likelihood of keeping their phones on or near them—Selective-

TABLE 3 | Cell phone habits while completing homework.

			Selective Texters	Positive Selective Texters	Moderate Texters	Positive Practical Moderate Texters	Frequent Texters	Positive-Frequent-Texters	Total	Significance
Mode	Ringer or vibrate on	n	3	8	19	22	5	13	70	Fisher's exact = 0.036
		% of cluster	38%	67%	66%	69%	56%	100%	68%	
		Adjusted residual	-1.923	-0.102	-0.333	0.115	-0.835	2.648	-	
	Ringer or vibrate off	n	5	4	10	10	4	0	33	
		% of cluster	63%	33%	34%	31%	44%	0%	32%	
		Adjusted residual	1.923	0.102	0.333	-0.115	0.835	-2.648	-	
Location	On or next to participant	n	2	8	14	22	8	10	64	Fisher's exact = 0.044
		% of cluster	25%	67%	48%	69%	89%	77%	62%	
		Adjusted residual	-2.255	0.344	-1.815	0.929	1.732	1.176	-	
	Not on or next to participant	n	6	4	15	10	1	3	39	
		% of cluster	75%	33%	52%	31%	11%	23%	38%	
		Adjusted residual	2.255	-0.344	1.815	-0.929	-1.732	-1.176	-	
Total	-	-	8	12	29	32	9	13	103	-



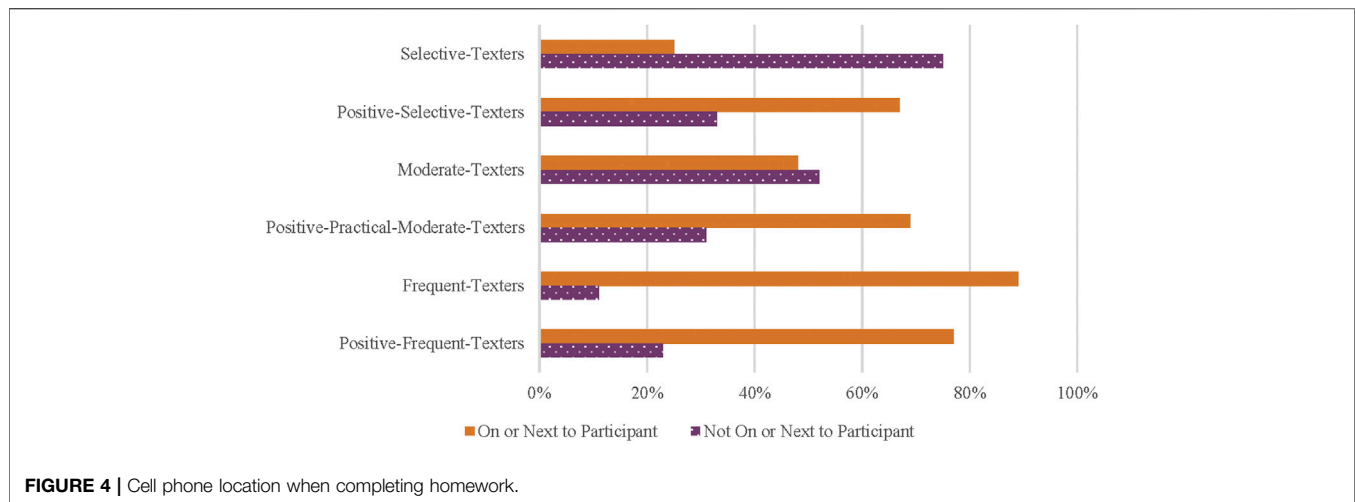
Texters were less likely than expected to do so (adjusted residual = 2.26, Table 3 and Figure 4).

DISCUSSION

These findings demonstrate that young adolescents vary not only in the frequency, but also in the motives for texting. We identified demographic differences between clusters that were similar in frequency of texting but were different in motives. For example, all the Frequent-Texters were girls, compared to less than half (41%) of the Positive-Frequent-Texters. It seems that the boys who texted frequently tended to use texting primarily to share positive emotions or for practical reasons. Our findings are consistent with

research on gender differences in expressing emotions, which suggests that men are more likely to suppress emotions rather than to express them (Gross and John, 2003) and less likely to seek social support when dealing with stress (Nolen-Hoeksema and Aldao, 2011). Our findings, along with studies demonstrating that girls spend more time texting (Twenge and Martin, 2020) and are more likely to report having “long text exchanges on personal matters” (Lenhart et al., 2010 p. 3) are further evidence that gender differences and norms in digital communication may mirror those in face-to-face interactions.

We found that Frequent-Texters started texting at an earlier age (marginally) than Selective-Texters, suggesting that the age at which adolescents begin texting may explain the frequency of use. A survey of middle-schoolers found that young adolescents text



more frequently over time (Schroeder et al., 2016). Interestingly, Positive-Selective-Texters tended to start texting at an earlier age than the Selective-Texters. It is possible that with more experience, Positive-Selective-Texters chose other forms of communication for sharing negative emotions.

Patterns of texting among young adolescents were related to differences in their cell phone habits while sleeping and completing homework. Frequent-Texters were the only cluster where nearly all participants kept their cell phone on or near their bed. These behaviors may result in greater risk of disrupted sleep, as prior research indicates that adolescents who took their phone to bed were more likely to be awakened by a text message (Adachi-Mejia et al., 2014). These patterns of use were not observed among Positive-Frequent-Texters, suggesting that among high frequency texters, texting to express negative emotions may provide a uniquely important reason for keeping one's phone nearby at night. As the mere presence of a cell phone can buffer against stress when individuals experience social exclusion, perhaps having a phone nearby at all times is especially comforting for those who rely on it the most for emotional support (Hunter et al., 2018). Almost all Frequent-Texters kept their phone on or near them while doing homework, although the frequency was not greater than the expected frequency.

Conversely, Selective-Texters may be at a lower risk for being disrupted while completing homework. They were less likely to keep their phone on or near them, which is expected given that they do not text often and report low levels of texting to share emotions. However, it is also worth considering the potential benefits to having phones on hand while completing homework, such as the ability to ask for help (Eisenhart and Allaman, 2018). Texting others while doing homework may also increase positive affect, as middle school students reported greater interest and more positive affect when they did their homework with their friends than when they worked independently (Kackar et al., 2011). Boys tend to be less impacted by working alone and reap fewer benefits from working together (Kackar et al., 2011), which may explain why the Selective-

Texter cluster, which consisted primarily of boys, were less likely to keep their phones on or near them.

Other findings on cell phone habits when completing homework were less expected. Positive-Frequent-Texters were more likely to have the ringer on or to have their phone on vibrate and , but were not more likely to keep their phone nearby. Perhaps they wanted to be notified of incoming messages, but also wanted to reduce the impulse to read and respond. Positive-Selective-Texters were more likely to keep their phone in hand or in their pocket. Perhaps they felt more comfortable having their phone nearby as they were less likely to impulsively use it. Interviews and surveys of youth find differences in the abilities to self-regulate cell phone use while doing schoolwork (e.g., Tulane et al., 2014).

Notably, in identifying differences between Frequent-Texters and Positive-Frequent-Texters and between Selective-Texters and Positive-Selective-Texters, we suggest that future studies on the health impacts of texting, or social media use more broadly, consider not only the frequency of, but also the motives for use. A recent study found that for half the sample, social media use had a positive effect on mental health. For the other half, social media use had a negative or neutral effect (Beyens et al., 2020). Perhaps differences in motives may explain the heterogeneity of effects. A different study found that using social media to escape from negative emotions was associated with addictive social media use, but using social media for other reasons, such as to search for information and to interact with others, was not (Brailovskaia et al., 2020).

Limitations

It is important to note that a participation requirement for the larger study was that participants come with a friend with whom they texted at least once a week. Thus, truly infrequent texters (less than once a week) may have been excluded. A second limitation is that we may not have been able to detect smaller clusters because our sample size was determined by the larger study rather than the recommended sample size for a person-centered analysis (Howard and Hoffman, 2018). Moreover, our sample size may limit the replicability of our results. Although

our sample is ethnically diverse, studies with larger samples from broader geographical areas are needed to help establish the replicability of our clusters. A third limitation is that our reasons for texting were global and did not differentiate between texting with friends, romantic partners, parents, or other family members. Adolescents tend to text about negative emotions and events more frequently with their peers than with their parents (Ehrenreich et al., 2020); thus, future studies may consider whether motives for texting vary depending on the texting partner. Fourth, our questions focused on motivations for texting and did not ask questions about reasons for replying to texts (e.g., respond to friend's negative emotions or need for help). Finally, self-reported cell phone use may be inaccurate. Adolescents may under-report poor cell phone habits (i.e., keeping the ringer on during sleep) due to social desirability bias. They may over-report their texting use, as cell phone usage is difficult to recall (Verbeij et al., 2021). Nonetheless, self-reported cell phone use and actual cell phone use are often correlated (Boase and Ling, 2013; Andrews et al., 2015), suggesting that we may still be able to distinguish between high and low frequency texters. Despite these limitations, our study demonstrates the utility of person-centered analyses, laying the foundation for future studies that look at adolescents' motives of media use.

Future Studies

Future research should explore different types of texting partners (e.g., parents, friends), other reasons for texting (e.g., to share content, to pass the time, reply to a request), and the links between experiencing specific emotions and texting behaviors (e.g., experiencing anger and venting, experiencing sadness and seeking distractions). This study focused on instances of meeting one's own needs (e.g., asking for advice, expressing emotions), rather than texting to meet the needs of others (e.g., giving advice, providing encouragement). Future work should explore the patterns of texting responses. Contextual information about texting interactions (i.e., when, why, and with whom) may be gathered at the end of the day or even in real-time. Additionally, future research should examine whether cell phone placement and mode are associated with less and lower quality sleep and learning (e.g., poorer concentration, greater affect from working collaboratively). Finally, researchers should examine the factors adolescents consider when deciding where to place their phone and what mode to put it on. Identifying these factors will help inform interventions that promote healthy cell phone habits.

CONCLUSION

By highlighting the heterogeneity in how much and why young adolescents use text messaging and identifying unique clusters of users (i.e., Frequent-Texters) that are at greater risk for disrupted sleep or learning, our study demonstrates the utility in measuring not only the frequency of texting, but also the motives for use. Texting is ubiquitous in young

adolescents' lives (Rideout and Robb, 2019) and researchers need to understand the motives for use as well as the frequency, in order to determine the impacts of texting on health and learning.

DATA AVAILABILITY STATEMENT

The dataset for this article is not publicly available because participants were not asked if they would consent to their data being shared. Requests to access the datasets should be directed to the corresponding author.

ETHICS STATEMENT

This study was reviewed and approved by the University of California, Irvine Institutional Review Board. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin and participants provided written assent.

AUTHOR CONTRIBUTIONS

JY contributed to all aspects of the study, PM contributed to the analyses and writing, and SR contributed to the design of the study and revised the manuscript critically for intellectual content.

FUNDING

This work was funded by the University of California, Irvine Public Impact Fellowship and the University of California, Irvine Undergraduate Research Opportunities Program.

ACKNOWLEDGMENTS

This work was previously presented at the 2019 Society for Research in Child Development Biennial Meeting under the title, "Texting Profiles in Early Adolescence." Special thanks to our research assistants Karina Guadalupe, Jonathan Lee, Hua Luo, Jason Moreno, Christine Nam, Alex Salgado, Jennifer Siu, Branda Sun, Derek Xu, and Katrina Yip and to our participants and their families.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fhumd.2021.602368/full#supplementary-material>

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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