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RESEARCH ARTICLE

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Days with and without self-injurious thoughts and behaviors: Impact of childhood maltreatment on adolescent online social networking

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Abstract

Introduction: Among adolescents, an increasing rate of interpersonal interactions occurs online. Previous research has shown that interpersonal context exerts a robust impact on suicidal thoughts or behaviors, yet little attention has focused on examining the content of online interactions surrounding self-injurious thoughts or behaviors. As such, the present study sought to compare online social networking behaviors among adolescents on days with and without experiencing self-injurious thoughts or behaviors, as influenced by childhood maltreatment history.

Method: Adolescents aged 13–18 hospitalized for self-injurious thoughts or behaviors were recruited as part of an ongoing longitudinal study. A subsample ($N = 22$) of adolescents provided data from their online social networking platforms (i.e., text messages, Facebook, Instagram, and Twitter). Using a mixed-methods approach, online social networking data on days of experiencing self-injurious thoughts or behaviors and days of not experiencing self-injurious thoughts or behaviors were compared.

Results: Results indicate the frequency and content of online social networking messaging do not change by day of self-injurious thoughts or behaviors or history of childhood maltreatment. However, childhood maltreatment predicts received conflictual messages as well as sent symptomatic messages on days of experiencing self-injurious thoughts or behaviors.

Conclusions: Childhood maltreatment may play a role in the content of adolescent online behaviors, particularly on days when they experience self-injurious thoughts or behaviors. Implications for intervention are discussed.

KEYWORDS

self-injurious thoughts and behaviors, social networking, suicide

1 | INTRODUCTION

Self-injurious thoughts and behaviors, or SITB, include suicidal thoughts and attempts, as well as nonsuicidal self-injury, which is defined as any deliberate destruction of body tissue without the intent of death (Nock & Favazza, 2009; Nock et al., 2009). SITB tends to emerge in adolescent years (Gould et al., 2003; Harms et al., 2019), and is a major worldwide public health concern, with suicide as the second leading cause of death for ages 10–24 years, globally (Bursztein & Apter, 2009; Czyz et al., 2019; Kõlves & De Leo, 2016; Patton et al., 2009; Sedgwick et al., 2019). High school respondents to the 2019 United States Youth Risk Behavior Survey reported concerning levels of SITB including seriously contemplating suicide (19%), having made a plan (16%), and having made an attempt (9%; Ivey-Stephenson et al., 2020).

Risk factors for SITB may begin in early childhood and include sexual (Castellví et al., 2017; Fergusson et al., 2008), physical (Dunn et al., 2013; Gomez et al., 2017), and emotional abuse (Gibb et al., 2001; Miller et al., 2017); this connection between childhood maltreatment and SITB is well established (Cha et al., 2018; Liu et al., 2018; McRae et al., 2022; Serafini et al., 2017). In addition to early life maltreatment, low social support, or lack of interpersonal interactions that help individuals feel "valued, loved, and cared for" (Zhang, 2009), is a known risk factor for depression and suicide (Bursztein & Apter, 2009; Dai et al., 2016; Harms et al., 2019; Pages et al., 2004). In a study using ecological momentary assessment to explore in vivo influences on SITB, Czyz et al. (2019) found that low feelings of connectedness were significantly associated with suicidal ideation the next day when combined with high levels of burdensomeness or hopelessness. Other studies have replicated the finding that interpersonal stressors (e.g., being alone and conflict) precede SITB events 83% of the time (Brodsky et al., 2006; Herpertz, 1995; Welch & Linehan, 2002). In addition, adolescents with a history of nonsuicidal self-injury, compared to those with no history of nonsuicidal self-injury, reported fewer categories of people they can reach out to for help or talk to when experiencing distress (Evans et al., 2005).

Conversely, perceived social support may act as a buffer against SITB (Fredrick et al., 2018). For example, adolescents who reported high levels of parent support were less likely to develop SITB following a stressful event (Mackin et al., 2017); other studies point to peer relationships as protective against SITB (Farrell et al., 2015; Fredrick et al., 2018). Most studies to date have compared social support between subjects with and without SITB. However, relatively little is known about in vivo daily social interactions on days with and without SITB events among high-risk adolescents.

Importantly, online interactions represent an increasing proportion of adolescent social worlds: 73% of U.S. adolescents with access to the Internet utilize social networking sites (Davis, 2012; Purcell, 2011) and most frequently access Facebook, Instagram, Twitter, and "other" sites (Smith & Anderson, 2018; Stockdale & Coyne, 2020). Although motivations for social media use include seeking distraction, entertainment, and utilizing as a creative outlet (Y. Kim et al., 2011; Radovic et al., 2017), teens most often report using these sites to communicate with friends (Barker, 2009; Davis, 2012; Stockdale & Coyne, 2020). Further, survey findings suggest text messaging as the primary mode of conversation between adolescent friends (Davis, 2012; Lenhart et al., 2010). Behavioral research has increasingly examined online social networking content and usage patterns for their potential to characterize and predict effects and behavior both on- and offline (Kapoor et al., 2017; Althoff et al., 2017; Azucar et al., 2018; Sapountzi & Psannis, 2018). Research that examines online social networking can provide unique and data-rich insight into current forms of adolescent social support (Binder et al., 2017; Zhang, 2009).

Past research has examined the appeal of online social networking for adolescents (Subrahmanyam & Greenfield, 2008; Valkenburg & Peter, 2011), as well as the role it plays in peer victimization (Khurana et al., 2015; Maas et al., 2019; Resnik & Bellmore, 2019; Wisniewski, 2018), emotional, psychological and subjective well-being (Colì et al., 2019; Erreygers et al., 2019; Hsu et al., 2020; Khodarahimi & Fathi, 2017; H. H. Kim, 2017; Zhou & Zhang, 2019), depression (J. B. Li et al., 2018; Memon et al., 2018), and potential intervention strategies (Baldofski et al., 2019; Kaess et al., 2019). Yet little is known about online social networking behaviors in adolescents at high risk for SITB. Online social networking data may be especially salient among adolescents with SITB because of ease of access to social support (Nowland et al., 2018). Despite the suggested ease of access, research to date has not characterized online social networking messaging among adolescents at high risk for suicide.

Purposeful use of online social networking to seek support may protect against symptoms of SITB and offset the impact of adverse life events (De Choudhury & Kiciman, 2017; Nick et al., 2018; Radovic et al., 2017). This is consistent with the finding that about one-third of adolescents who engaged in nonsuicidal self-injury have gone online to seek help regarding their self-injury (Sedgwick et al., 2019). This is an important finding, as nonsuicidal self-injury is associated with prior (Nock et al., 2006) and future (Scott et al., 2015) suicide attempts. Furthermore, Wilks et al. (2019) found that suicidal ideation was associated with preferences for online help, over in-person, among college students who identified as female. More data is needed to better understand how adolescents with suicidal thoughts or behaviors use online social networking for active and passive help-seeking, as well as how problematic online social networking exchanges among this population may contribute to SITB (e.g., conflict, low rates of received messages).

While online social networking can further serve adolescents' desires for social connection and support (Davis, 2012; S. Li et al., 2019; Moreno et al., 2011; Radovic et al., 2017; Sedgwick et al., 2019), online exchanges require unique methods to operationalize and measure interactions (Sapountzi & Psannis, 2018). Davis (2012) classifies online communications as: (1) casual, encompassing exchanges of practical information, small talk, and jokes, or (2) intimate, consisting of more personal information and self-disclosure. Both casual and intimate interactions may be enacted through public or private posts, as well as messages to individuals or groups. Public posts may convey a "passive" attempt at seeking social support, such as posting a status update about one's mood without directly asking for a response (Moreno et al., 2011; Radovic et al., 2017). Research that examines the frequency and forms of casual or intimate online social networking exchanges that occur on days adolescents engage in SITB may provide critical insight into interpersonal risk factors.

Given maltreatment is common among adolescents with SITB (Finkelhor et al., 2007; Greeson et al., 2014; McLaughlin et al., 2013), it is important to consider its role on online social networking behaviors. Research indicates that individuals with a history of child maltreatment have deficits in social interactions that occur offline. For example, children who were

exposed to maltreatment associated sadness with both positive and negative interactions (Perlman et al., 2008), evidenced errors in judgment in interpersonal reasoning situations (DePrince et al., 2008), and had more difficulties in social perspective-taking (Burack et al., 2006). Similar interpersonal problems may present in online social networking interactions, and some evidence indicates greater risk online due to the lack of facial expressions or body language (Barlett & Helmstetter, 2018; Barlett et al., 2016). This study seeks to better understand how childhood maltreatment may be associated with online social networking interactions in adolescents who are at high risk for future SITB.

Given the association between social support and SITB, research is needed to examine differences in daily communication on online social networking on days with SITB compared to days without SITB among high-risk adolescents. Current methods of assessing social support are mostly limited to self-report and there are strong indications for objective and multimethod approaches (Galione & Oltmanns, 2014). The frequency and content of online social networking may influence the chance of an SITB, especially among adolescents who were hospitalized for SITB. This study is the first to examine the relationship between suicidal thoughts or behaviors and childhood maltreatment on the frequency and content of online social networking interactions among adolescents at high risk for suicide. Thus, the aims of the current study are exploratory and set to investigate: (1) the frequency and content of online social networking on days with and without experiencing SITB among high-risk adolescents and (2) whether a previous experience of childhood maltreatment is associated with the frequency and content of online social networking interactions on days of experiencing SITB.

2 | METHODS

2.1 | Participants

The present sample was comprised of adolescents hospitalized for SITB and recruited from the adolescent inpatient unit of a pediatric psychiatric hospital in the northeast United States. Participants were deemed ineligible if they did not speak English, if they were diagnosed with a primary psychotic disorder or if their age fell outside the intended range (13–18). A total of 194 participants were recruited. As part of a supplemental study presented to 125 participants, 75 participants agreed to the download of their online social networking data. Participants were compensated $25 for online social networking extraction. For reasons such as the participant forgetting their account passwords, not having access to their phone during the assessment period, changing their phone during the assessment period, and technical error, online social networking extractions were successfully completed for 31 participants. Of these 31 participants, 22 reported SITB in the days surrounding hospitalization (i.e., the days included in the online social networking download, explained further below). Full demographic information for the final sample ($N = 22$) is provided in Table 1. The participants who did not report SITB in the timeframe observed did not differ demographically from those included in further analyses. Regarding childhood maltreatment, those who did report SITB in the timeframe observed reported higher overall emotional abuse than the nine participants who did not report suicidal thoughts or behaviors in the timeframe observed. There were no other differences in reported childhood maltreatment from those who were ($N = 22$) and were not ($n = 9$) included in the final sample. The majority of the sample of participants were assigned female sex at birth ($n = 14$, 63.6%; male $n = 8$, 36.4%) and identified as a girl or woman ($n = 11$, 50.0%; boy or man $n = 9$, 40.9%; in some other way $n = 2$, 9.1%). The subset of participants was comprised of participants reporting that they were: Asian ($n = 1$, 5.0%) Black or African American ($n = 1$, 5.0%), White ($n = 14$, 70.0%), and more than one race ($n = 4$, 20.0%). The age range for the present subsample was 13–17 ($M = 15.2$, SD = 1.4).

2.2 | Measures

2.2.1 | Childhood maltreatment

Experiences with childhood maltreatment were assessed using the Childhood Trauma Questionnaire (Bernstein et al., 1998). This scale contains 28 items that ask respondents to rate how often they experienced a certain form of abuse during their childhood or teenage years. Answer options fall along a 5-point Likert scale ranging from 0 (“Never True”) to 4 (“Very Often True”). The six subscales of the Childhood Trauma Questionnaire (i.e., physical abuse, physical neglect, emotional abuse, emotional neglect, and sexual abuse) were used for the present analyses. In an initial evaluation of four diverse samples, including a sample of adolescents hospitalized for psychiatric concerns, the Childhood Trauma Questionnaire subscales yielded test–retest reliability coefficients ranging from 0.79 to 0.86, and internal consistency coefficients ranging from 0.66 to 0.92 (Bernstein et al., 2003).

TABLE 1 Demographic characteristics of participants ($N = 22$)

	M	SD
Age (years)	15.2	1.4
	N	**%**
Sex assigned at birth		
Male	8	36.4
Female	14	63.6
Gender		
Boy or man	9	40.9
Girl or woman	11	50.0
I identify in some other way	2	9.1
Race/Ethnicity		
White	14	63.6
Black or African American	1	4.5
Asian or Asian American	1	4.5
More than one race	4	18.2
Declined to state race	2	9.1
Hispanic/Latino/Latinx	5	22.7
Not Hispanic/Latino/Latinx	17	77.3
Sexual orientation		
Heterosexual or straight	9	40.9
Bisexual	4	18.2
Not sure	1	4.5
None of the above	5	22.7
Declined to state sexual orientation	3	13.6

2.2.2 | Online social networking

As part of the larger study examining the social context surrounding adolescent inpatient hospitalization, online social networking data from the 2-week period before hospitalization and the 3-week period following hospitalization were extracted. At 3 weeks postdischarge from hospitalization, participants were asked which platforms they would be willing to share with researchers.

Adolescent online social networking data was extracted using Sochiatrist, a software developed by the Brown University HCI Research Group (Massachi et al., 2020). This software allows for the extraction of messaging data from multiple web- and mobile-based platforms. More specifically, the software extracts direct messaging content and metadata (i.e., contact identifier, timestamps, and platform) directly from participants' mobile devices or through their online social media accounts. To access text messaging data, the Android or iOS mobile device is required, and data is accessed by reading from a backup performed of the device (Massachi et al., 2020). Participants in the present study ($N = 31$) provided text messages, Facebook direct messages, Facebook metadata, Instagram direct messages, Instagram metadata, Twitter direct messages, and Twitter metadata. As extraction requires a mobile device or means of accessing account passwords, the participant was required to be present during extraction.

Sochiatrist software removes all non-text content (i.e., images and videos) and a pseudonymization script was run to replace identifying information in the messages, such as names and numbers, with hash or symbol while maintaining the structure of the anonymized information. For example, if a message contained a phone number, the individual numbers would be replaced with hash, but the telephone format would remain so coders could discern the meaning of the original content (i.e., "###—###—####"). The name of the person with whom the participant was conversing was replaced with a consistent string of mixed letters and numbers (a *contact identifier*), such that the identity of the contact was unknown to

coders, but coders could still reference which messages came from the same contact. Extracted data is combined into CSV format, with columns designating the time and date of the message, the content of the message, the contact identifier, and the social networking platform.

2.2.3 | Suicidal thoughts and behaviors

The modified Timeline Followback (TLFB) (Sobell et al., 1996) was used to identify days of experiencing SITB. Participants were asked to retrospectively identify days they had attempted suicide, experienced suicidal thoughts, or engaged in nonsuicidal self-injury. First, TLFB was conducted during inpatient hospitalization when participants were asked to identify experiences of SITB in the prior 30 days. TLFB was completed again at a 3-week postdischarge follow-up, during which participants identified days of experiencing SITB since their discharge from inpatient hospitalization.

2.3 | Thematic analysis

Days of experiencing SITB were selected to be the first day of reported SITB within the extracted online social networking timeframe surrounding hospitalization. Days of not experiencing SITB were selected as the first day of reported no SITB within the online social networking timeframe surrounding hospitalization. In total, 31 successful extractions were completed with participants, but nine of those participants did not have a day within their online social networking timeframe when they reported SITB and were excluded from further analysis. Both a day of experiencing SITB and a day of not experiencing SITB were selected for the remaining 22 participants. As such, the resulting 44 days analyzed were comprised of 22 days of experiencing SITB and 22 days of not experiencing suicidal thoughts or behaviors. Of the days of suicidal thoughts or behaviors selected, 14 days were before hospitalization, and 8 days were after discharge from hospitalization.

As the present study sought to compare two sets of data that pertain to separate situations of the same study, a *deductive* and *inductive* thematic coding process was appropriate (Alhojailan, 2012), allowing researchers the flexibility to examine a priori and *emergent* themes from the data (Hayes, 2013). Using NVivo software, initial a priori themes were established based on the structure of message data (i.e., sent and received) and the purpose of the current study (i.e., suicidality). Specifically, a priori themes were *sent* and *received*, *suicidal thoughts or behaviors*, *symptoms, conflict,* and *support seeking* or *support giving*. In addition, it was predicted adolescents would use messaging to coordinate daily plans and logistics. Therefore, a *planning* code was included a priori. Once this initial structure was established, coding began with days of experiencing SITB and was iterative in nature, such that themes were added to the existing coding scheme as they emerged from the data set. A team of two coders coded each individual message, post, and comment together. Disagreements of coding were debated in real-time between coders until consensus was achieved. For any potential cases lacking resolution, coders were prepared to approach a third reviewer with expertise in the field (i.e., primary investigator and author). In addition, this third reviewer offered ongoing oversight in the development of the codebook. Both coders were in their early twenties and thus familiar with the current slang utilized by adolescents in their online social networking communication. Similar coding processes (e.g., two primary coders, primary investigator as consensus coder, both deductive and iterative coding) have been utilized previously for online social networking data (Bogen et al., 2018; Bogen, Bleiweiss, Leach, et al., 2019; Bogen, Bleiweiss, & Orchowski, 2019; Ranney et al., 2020).

When all days of experiencing SITB were coded ($N = 22$), the established codebook was then utilized to complete coding of all days of not experiencing SITB ($N = 22$). Once completed, some subthemes were collapsed within their larger theme for clarity, and others were removed for falling below a 2% saliency cutoff (Bogen, Bleiweiss, Leach, et al., 2019; Orchowski et al., in press). For example, the *symptoms* theme subsumed codes such as *depression, anxiety, physical symptoms, frustration*, and *suicidal thoughts or behaviors*. In addition to the low numbers of messages coded at these themes (i.e., not meeting 2% saliency), it was difficult to disentangle symptoms associated with different diagnoses without adequate context. Thus, these subthemes were collapsed.

2.4 | Statistical analyses

To address the study's aims of comparing online social networking behaviors in the context of SITB and childhood maltreatment, we conducted a series of analyses. First, analyses examined the overall frequencies of online social networking use by social media format and coded themes. To analyze differential use of online social networking between days when SITB did and did not occur, we conducted two-tailed paired-sample *t* tests for the number of sent, received, and total messages. Similar analyses were conducted for each of the coded themes (i.e., based on the qualitative content of the messages). Specifically, a two-tailed paired-sample *t* test comparing the number of conflictual messages on days with and

without SITB was conducted, and repeated for each major theme (conflict, notifications, practical, small talk, support, and symptoms).

Next, linear regressions were conducted to test whether childhood maltreatment scores predicted the frequency of total, sent, and received messages on days with SITB. Lastly, childhood maltreatment scores were entered into linear regressions to determine whether childhood maltreatment predicted the occurrence of specific online social networking themes on days of experiencing SITB. All regression analyses controlled for sex and timepoint of SITB (i.e., before or after hospitalization).

3 | RESULTS

3.1 | Thematic analysis

To better understand the content of online social interactions during the high-risk period surrounding hospitalization (aim #1), the messages were first aligned with two mutually exclusive major categories, sent and received. The resulting codebook organized identical themes under the sent and received categories (see Table 3) with identical operational definitions of themes which were not mutually exclusive. Messages consisting entirely of content that was not text-based (i.e., photo or video content that was excluded from download) were not included in thematic analyses. In total, 556 received and 708 sent messages were coded for days of experiencing SITB, and 858 received and 842 sent messages were coded for days of not experiencing SITB. All "direct quotes" cited below have been slightly altered to protect against reverse identification (Ayers et al., 2018; Golder et al., 2017). Although the identities of those conversing with the participants were anonymized, the type of relationship (i.e., parent, friend, romantic partner, and classmate) was often discernable given the topic of conversation discussed, or the content of the messages (i.e., the participant using the pronoun "mom" instead of the mother's name).

3.1.1 | Conflict

Online social networking content was categorized as conflictual if it conveyed a tense, argumentative, or combative tone or message. For example, one participant was warned "You ask for what you don't want, so how bout you don't call me that." In this exchange, it was clear the participant was challenging a peer, and the peer was threatening/warning them not to take it any further. Conflictual messages tended to be between peers, but this theme also arose when parents placed limits or expectations on their teens: "Your responsibility is school for the whole day every day. You must be productive, kind, and not this menace to society."

3.1.2 | Notifications

This theme encompassed automated messages that notified the participant of an action taken with one of their accounts. For example, participants received messages pertaining to their social media accounts (i.e., "XXXX and XXXX are now friends"), payment accounts (i.e., "PayPal: Your current PayPal account balance is ##.## USD"), and community accounts (i.e., "4 Hold (s) ready for pickup @ XXXX Library"). As the nature of this category is such that it is an automated message, no sent messages were categorized as this theme.

3.1.3 | Practical

This theme represents messages that serve to provide information, plan, coordinate, or schedule an activity. Many messages coordinated drop-off and pick-up times between the adolescent and their caregiver: "Leaving work in XX minutes. Be there soon." Other practical messages between caregiver and adolescent were for the purpose of serving other daily necessities, such as eating. For example, one parent messaged their adolescent, "Your sandwich is in the fridge." This category also encompassed an adolescent explaining how they have insufficient money to complete a transaction, asking their parent to look at a brochure to purchase something, and informing someone that a car had blocked them in their parking spot.

Planning

This subtheme was specified messages coordinating an event or gathering. For example, as the current population was recently psychiatrically hospitalized, it was common for caretakers to send messages reminding the adolescent of their

appointment, "Your appointment is on Monday, not Tuesday." Other times, the adolescent was requesting for their parent to schedule an appointment for them, "Do they have anything sooner? I need to talk to someone."

Daily activities

This category, within the larger "Practical" category, delineates messages that have a purpose to plan or coordinate activities with other people. Messages often categorized to this theme have content that is planning to spend time with family or friends. For example, "Hey! Today some of us are going to the beach, wanna go? You'll need gas money but let me know!"

3.1.4 | Small talk

Small talk was kept as a broad category and represented topics of conversation that were judged to be trivial in nature. For example, many participants had conversations about pop culture events and icons, video games, mutual acquaintances, and current activities. In reference to a livestream event hosted by an Internet celebrity, one participant messaged, "When you wake up and your fav YouTuber is steaming!" As this example shows, the messages within this theme are casual in nature and lack depth or emotional disclosure.

Filler

Messages coded at this theme were superficial and typically short in content. As a rule, these messages did not convey any information, even seemingly trivial information. Seemingly intentionally misspelling the word "yeah," one participant sent "Yehaahyehahh" Often categorized at this theme, as in this example, were short messages that serve simply to keep the line of communication ongoing, without furthering the conversation.

Pestering

Unexpectedly to coders, this theme emerged from the data and represented a persistent attempt to make contact with another person. These messages were typically repetitive in nature, "Pa/Pa/Pa/Pa/Pa", and sometimes even served as reminders or alarms, "Get up/Get up/Get up/Get up."

Public post

This subtheme represented any content the participant shared on their social media platforms. The most popular messages coded at this theme were Twitter re-tweets, which do not contain the participant's original content but rather endorse another Twitter user's content on their page: "RT MZKDFGJ: There are just too many to list, but I am inspired daily by the incredible, determined, talented women around me." Of note, the Sochiatrist software does not capture posts from other users (i.e., participants' friends) so this category did not include received messages.

3.1.5 | Support

This major theme encompassed messages that were comforting or reassuring in nature. The messages in this theme did not necessarily have to be lengthy or specific, as this message exemplifies: "Have a good day! Good luck on your midterm." As shown here, the message could relay a simple, yet thoughtful, encouraging message. This theme includes messages that provided a sentiment of care and kindness to another person. Often exemplified by compliments or words of esteem, this category encompassed messages that provided warmth and devotion. For example, one participant received this message from a friend, "daily reminder: you're pretty and I love you."

Furthermore, as the participants in the present sample were recently discharged, they often received messages inquiring about their well-being. One participant who was hospitalized during a holiday was asked, "I thought of you on [the holiday], how was it for you?" Implied within this theme, is the intent to gather information on another's mental distress given the high-stress period surrounding hospitalization.

To show support, some messages within this theme provided an opinion as if to provide a way of understanding a situation, or as a means of providing inspiration. One participant received, "I really think this next year is going to be good for you," seemingly with the intent to stimulate a favorable opinion on the upcoming year. Other opinions were less forward-thinking, "That's not too healthy to spend a lot of time to just lay there," but nevertheless provided an opinion on how the participant was coping with their distress. Lastly, other messages within this theme provided the recipient with comfort, validation, and optimism. In response to one participant expressing anxiety over the transition back to school after hospitalization, a caregiver wrote, "Don't worry about school. In speaking to the teachers, they're are all on your team. They'll even tutor you after school if you need it. Just focus on feeling better."

TABLE 2 Number of messages on days with and without suicidal thoughts or behaviors

	Event day		Non-event day	
	Sent	Received	Sent	Received
Mean	35.68	28.9	38.7	42.6
SD	65.19	59.6	104.9	104.7

Note: Event day = days with suicidal thoughts or behaviors, Non-event day = days without suicidal thoughts or behaviors.

3.1.6 | Symptoms

This theme encompasses a range of symptomology denoting both mental and physical discomfort. Common symptoms expressed by both participants and their contacts were anxiety (i.e., "I can't stop thinking about that teacher yelling at me about weed. Like its destroying me"), depression (i.e., "I can't do anything right now. My body is too heavy and I can't get out of bed"), frustration (i.e., "I'm really pissed/I hate XXXX/'I don't care if you cry' Like what?/Fucking loser."), feeling unsupported (i.e., "My leg is gross and all swollen and I SHOWED MY MOM AND SHE DIDN'T DO NOTHING!"), an inability to identify what they're feeling (i.e., "Like I can't process this. Idk why its bothering me. Idk why I keep thinking about it. IDK."), grief (i.e., "I miss XXXX. I've been crying all day"), physical symptoms (i.e., "Ughhh I'm so itchyyyyy. Do you wanna see a vid of these bites? They're even on my toe and it's driving my crazy!"), and suicidal ideation (i.e., "I want to die. I'm pretty much crying in the middle of class rn").

While not all messages coded in this category explicitly discussed symptoms, coders used other indicators to conceptualize these categories. For instance, to return to the earlier example of anxiety, many of the ongoing messages in this discussion were repetitive, with the participant insisting they've stopped using substances. The participant even revisited this discussion once the topic had changed, portraying an overall sense of uneasiness about the experience in the classroom. These patterns combined further portrayed the symptom of anxiety above and beyond the transcript of the messages. Similarly, suicidal messages were broadly understood, and included any messages that referenced suicide in a more casual nature. For example, "kms" (i.e., kill myself) was sometimes used in a sarcastic tone in response to a minor hardship and was categorized as a symptom.

3.2 | Statistical analyses

First, to examine the frequency and content of online social networking on days with and without experiencing SITB (i.e., first aim), the overall frequency of online social networking use, differential use by social media format, and qualitative coded themes were examined. Table 2 describes the frequency of messages on days with and without SITB. There was no statistical difference in frequency of sent messages for days with SITB ($M = 35.68$, SD = 65.19) compared to days without SITB, $M = 38.73$, SD = 104.87; $t(21) = -0.22$, $p = .830$; received messages for days with SITB, $M = 29.91$, SD = 59.57, compared to days without SITB, $M = 43.64$, SD = 104.70; $t(21) = -1.17$, $p = .257$; and total messages for days with SITB, $M = 64.59$, SD = 121.6, compared to days without SITB, $M = 81.36$, SD = 208.4; $t(21) = -0.67$, $p = .508$. Additional two-tailed, paired-sample t tests were conducted to compare the number of messages per theme on days with and without SITB. Results indicate no significant difference in the number of messages at each theme on days when SITB did and did not occur.

To address the second aim of examining whether childhood maltreatment is associated with the frequency and content of online social networking on days of experiencing suicidal thoughts or behaviors, a series of linear regressions were conducted. To examine whether childhood maltreatment history is associated with online social networking usage on days when SITB occur, three linear regressions were conducted to test whether childhood maltreatment (i.e., Childhood Trauma Questionnaire total scores) predicted the frequency of total, sent, and received messages on days with SITB. No significant linear regression equations were found, suggesting that a history of childhood maltreatment does not predict the number of messages exchanged on days that SITB occur. Lastly, as outlined in Table 4, results from linear regressions indicate that higher childhood maltreatment total scores predicted the following content themes on days of experiencing SITB: received conflict, $F(3, 18) = 2.21$, $p = .038$, $R^2 = .27$; received small talk, $F(3, 18) = 1.80$, $p = .046$, $R^2 = .230$; and sent symptoms, $F(3, 18) = 2.26$, $p = .037$, $R^2 = .27$. Of note, the ability of higher childhood maltreatment total scores to predict sent conflict on days of experiencing SITB approached significance, $F(3, 18) = 2.09$, $p = .053$, $R^2 = .26$.

TABLE 3 Online social networking content themes (Day of reported suicidal thoughts or behaviors, $N = 1419$ messages; Day of no reported suicidal thoughts or behaviors, $N = 1772$ messages)

Secondary theme	Tertiary theme	Event day received messages, *n* (%)	Non-event day received messages, *n* (%)	Event day sent messages, *n* (%)	Non-event day sent messages, *n* (%)
Conflict		17 (1.2)	0 (0)	14 (0.1)	1 (0.1)
Description: Denotes tension through aggressive or defensive language, or makes an accusation					
Example: "I read that message with a cranky attitude."					
Notifications[a]		7 (0.63)	49 (2.8)	-	-
Description: Automated message that notifies the recipient of an action affecting their account					
Example: "AVGGI XXXXXX XXXXXX and CW28N SDFG4 are now friends."					
Practical		81 (5.71)	175 (9.9)	99 (7.0)	163 (9.2)
Description: Transmits information to schedule, coordinate or plan an activity or meeting					
Example: "Ok. I don't have good cell reception up here, just so you know"					
	Planning	34 (2.4)	128 (7.2)	37 (2.61)	126 (7.1)
Description: Messages with intent to schedule or coordinate an event or activity					
Example: "Hey, I'm on my way home now is it alright if my friend comes over. They have a ride"					
	Daily activities	41 (2.89)	139 (7.8)	52 (3.66)	136 (7.7)
Description: Coordinate everyday activities such as school, dinner, or spending time with friends or family.					
Example: "Hey! Some of us are going to the beach today at # to swim and then watch fireworks, wanna go?"					
Small talk		202 (14.2)	283 (16.0)	249 (17.6)	292 (16.5)
Description: Expresses topics of general conversation, such as asking how another person is doing, discussing figures of popular culture, or discussing everyday occurrences					
Example: "That pic would be a good phone background"					
	Filler	26 (1.83)	49 (2.8)	30 (2.1)	50 (2.82)
Description: Superficial, and usually short, messages that do not convey any information					
Example: "lol"					
	Pestering	0 (0.0)	0 (0.0)	48 (3.4)	0 (0.0)
Description: Identical, or nearly identical, repetitive messages to the same contact					
Example: "Ma/Ma/Ma/Ma/Ma"					
	Public post[b]	-	-	0 (0.0)	49 (2.8)
Description: A post on a social media platform					
Example: "RT SMLEJMGH: celebrate #internationalwomensday2018 my best ladies x"					
Support		41 (2.89)	10 (0.6)	48 (3.4)	13 (0.7)
Description: Utilizes supportive language in an effort to help the recipient					
Example: "Hope everything with you is going okay!"					
Symptoms		57 (4.0)	12 (0.7)	48 (3.4)	1 (0.1)
Description: Conveys the experience of emotional, psychological, or physical distress					
Example: "I don't feel sick, I just don't feel myself"					

Note: All themes were not mutually exclusive.

[a]This theme could only be received.

[b]This theme could only be sent.

TABLE 4 Childhood maltreatment predicting online social networking content on days of experiencing suicidal thoughts or behaviors

	B	SE	*β*	*p*
Received				
Conflict				
Timeline[a]	−2.15	1.30	−.35	.114
Sex	0.04	1.31	.01	.978
Childhood maltreatment[b]	0.14	0.06	.51	.038*
Notifications				
Timeline[a]	0.51	0.39	.29	.210
Sex	0.55	0.39	.32	.182
Childhood maltreatment[b]	0.00	0.02	.04	.883
Practical				
Timeline[a]	−5.58	3.28	−.39	.106
Sex	−1.35	3.31	−.09	.689
Childhood maltreatment[b]	0.00	0.16	.00	.988
Small talk				
Timeline[a]	−15.69	11.12	−.31	.175
Sex	3.43	11.22	.07	.763
Childhood maltreatment[b]	1.17	0.55	.50	.046*
Support				
Timeline[a]	−2.68	2.13	−.28	.224
Sex	−1.24	2.15	−.13	.570
Childhood maltreatment[b]	0.17	0.10	.39	.112
Symptoms				
Timeline[a]	−1.86	3.78	−.12	.628
Sex	1.32	3.81	.08	.732
Childhood maltreatment[b]	0.23	.19	.31	.234
Sent				
Conflict				
Timeline[a]	−1.64	0.96	−.37	.104
Sex	−0.08	0.97	−.02	.937
Childhood maltreatment[b]	0.10	0.05	.47	.053
Practical				
Timeline[a]	−5.77	4.12	−.33	.177
Sex	0.19	4.14	.01	.964
Childhood maltreatment[b]	0.04	0.20	.05	.845
Small talk				
Timeline[a]	−6.05	11.20	−.12	.595
Sex	−2.07	11.31	−.04	.857
Childhood maltreatment[b]	1.03	0.55	.45	.08

(Continues)

TABLE 4 (Continued)

	B	SE	*β*	*p*
Support				
Timeline[a]	−0.26	2.75	−.02	.925
Sex	1.10	2.77	.10	.697
Childhood maltreatment[b]	0.08	0.14	.16	.55
Symptoms				
Timeline[a]	−5.26	3.33	−.34	.132
Sex	−0.31	3.36	−.02	.928
Childhood maltreatment[b]	0.37	0.16	.51	.037*

[a]This variable represented whether the online social networking analyzed was pre- or post-hospitalization.

[b]Childhood maltreatment is defined as total scores on the Childhood Trauma Questionnaire.

*$p < .05$.

4 | DISCUSSION

This is the first study to examine adolescent online social networking and SITB during the weeks surrounding psychiatric hospitalization for suicidal thoughts and behaviors. Findings from the present research showed there were no statistical differences in the *frequency* of sent and received messages on days when teens reported SITB relative to days when they did not report SITB. This finding suggests that approaches to identify the within-person risk of SITB that rely solely on a number of messages are unlikely to be successful. These raw count variables were also unrelated to childhood maltreatment history. Unfortunately, dashboards that solely reflect minutes of use on a smartphone or a particular app do not provide sufficient information to inform predictive models. Instead, future research should extend the current thematic analysis and focus on the content of online messaging and activity as a means for predicting and understanding SITB.

The present study offers a novel and data-rich insight into adolescent online social communication during the stressful transition back to daily life after inpatient hospitalization (Binder et al., 2017; Zhang, 2009). Given the established association between childhood maltreatment and challenges in interpersonal relationships (Burack et al., 2006; DePrince et al., 2008; Perlman et al., 2008) as well as SITB, research was warranted to characterize these processes in online interpersonal interactions during the high-risk transition of adolescents from inpatient hospitalization (where they do not have access to online social networking) to their home environments. Results from the thematic analysis show that conversations vary, with the largest theme in the current data (i.e., small talk) only representing approximately 16% of content across days with and without experiencing SITB. Other categories that emerged from the data set further support Davis's (2012) categorization of "casual" and "intimate" content: Themes such as *notifications*, *practical*, and *small talk* could be understood as "casual," while themes of *conflict*, *support*, and *symptoms* could fall within the "intimate" categorization. These results emphasize that online social networking platforms serve as both a tool for pragmatic communication and a mechanism for meaningful discussion of symptoms and support. Thus, interventions that help adolescents optimize their use of these technologies may not only steer them away from maladaptive communication patterns but can further equip them to engage in dialog that lessens the symptoms common in those with SITB (Nowland et al., 2018). Moreover, though there was variance in the frequency of daily online social networking use between participants, ranging from 0 to 948 messages, this did not vary by experience of SITB. Therefore, the current findings suggest adolescents at high risk still utilize online social networking regardless of experiencing SITB on that day. This finding, coupled with the ease of accessibility of these technologies, further points to the potential for interventions to target online social networking for adolescents who experience SITB. Furthermore, because adolescents use online social networking on days they experience SITB, interventions could target peer responses to disclosures of SITB.

To explore whether the association between childhood maltreatment and interpersonal sequelae (Burack et al., 2006; DePrince et al., 2008; Perlman et al., 2008) is also related to online communications, the present study examines how a previous experience of childhood maltreatment is associated with the frequency and content of online social networking interactions on days of experiencing SITB. Although present findings did not support a difference in the frequency of messages exchanged on days of experiencing SITB, childhood maltreatment history was associated with received conflict. Additionally, there was a nonsignificant trend toward childhood maltreatment predicting sent conflict on days of experiencing SITB, suggesting a need for further research to examine this potential relationship. Regarding received conflictual messages, it is possible that adolescents with a history of childhood maltreatment may be more likely to develop and maintain relationships with friends and romantic partners whose behavior toward them (and, correspondingly, the messages received from them) is more conflictual. It is also possible that youth with maltreatment histories may also be more

sensitive or reactive when presented with conflictual interactions from others in their lives. Indeed, commonly used and evidence-supported interventions such as dialectical behavior therapy (DBT) propose that early life experiences may mean that individuals experience interpersonal interactions in ways that may then result in a chain of thoughts and behaviors that may include SITB. The fact that social networking interactions, unlike in-person social interactions, are documented in text form means they have the potential to be reviewed later in calmer moments. As we have described elsewhere, this historic social networking data provides rich data when integrated into therapeutic settings (Nugent et al., 2019). While research on how to apply online social networking data to intervention work, researchers have highlighted the potential for these data to be reviewed with a therapist, in conjunction with established treatments, to help individuals reflect on their thought process and context in a way that is less subjected to recall bias (Nowland et al., 2018; Nugent et al., 2019).

Interestingly, childhood maltreatment history also predicted sent symptoms on days of experiencing SITB. To our knowledge, the association of maltreatment history with increased symptom reporting during occasions of experienced SITB has not been previously described. It is possible that youth with a history of maltreatment may experience greater symptoms overall, and that during episodes of SITB they are more likely to share these symptoms with others. Again, frameworks such as those guiding DBT interventions point to the possibility that when individuals are dysregulated, they may attempt to use their social networks to try to self-regulate. This has the potential to be adaptive if teens are able to reach out to social networks skillfully. Here again, the historic nature of such interactions provides a great opportunity for clinical interventions, in which providers and clients may later review real-life social networking exchanges to provide tailored feedback and coaching to teens about how to best capitalize on their social networks.

4.1 | Limitations and future directions

The use of novel methodology (i.e., Sochiatrist extraction of social networking) comes with limitations. First, as participants chose which platforms they were comfortable sharing, it is possible that important dialog took place on social media platforms not collected by researchers. Accordingly, it is possible a conversation occurred across multiple platforms, not all of which were extracted. Relatedly, the present research is limited to social networking interactions and so does not integrate social interactions that may have occurred in-person or through voice or video interactions (e.g., phone calls, socially interactive video gaming, facetime). Furthermore, the final codebook is limited in detail for various reasons. Potentially important subthemes of support and symptoms were collapsed because they did not meet the saliency threshold. This lack of saliency may be the result of the present sample size, and thus, further research with larger samples is warranted to capture additional nuance. In addition, the Sochiatrist software used for data extraction did not provide information on who the contact was, precluding coders from capturing certain detail. For example, coders were unable to label with certainty who was providing the participant with support (e.g., parent, friend, and romantic partner) because contacts were anonymized.

Finally, as the TLFB (Sobell et al., 1996) was used to identify days, not moments, of experiencing and not experiencing SITB, the present research describes the relationship between the daily variance in SITB and online social networking, rather than a momentary relationship. This is important to note, as this design did not permit examination of whether SITB followed (or preceded) receipt of conflictual messages and small talk. Thus, it is possible that findings regarding receiving conflictual messages on days of experiencing SITB reflects either a response to received messages (i.e., suicidal thoughts or behaviors in response to conflictual messages) or rather, reflects behaviors from others that were evoked by the participant's behavior (i.e., suicidal thoughts or behaviors evoking conflictual messages from others). Future research may expand upon this study and address limitations by examining SITB using more momentary approaches and by integrating additional indicators of social context such as the audible social environment.

5 | CONCLUSION

Findings from the present research provide important information about the real-world social networking behaviors of adolescents during the transition from inpatient hospitalization to their home environments. Analyses supported the importance of qualitative analysis of interactions as opposed to simple calculations of metadata such as numbers of messages sent or received. Findings also point to ways that it may be natural to translate social media interactions into later clinical interventions, with participants' social network exchanges on SITB and SITB-free days observed to show different patterns as a function of participant maltreatment history. A number of interventions, such as DBT, that already integrate social interactions into the interventions (such as through chain analysis) could be enhanced by the planful incorporation of reviewing social networking data with participants.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Due to the nature of this study and language of consent materials, participant social networking data are not publicly available.

ETHICS STATEMENT

This study was IRB approved (Rhode Island Hospital IRB Net # 633181). All participants and their guardians provided consent/assent.

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