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Peer support of fathers on Reddit: quantifying the stressors, behaviors, and drivers

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Abstract

This paper aimed to delineate the behavioral patterns of fathers in seeking and providing peer support on the popular social media site Reddit using a sample of 2,393 users. First, fathers' support-seeking posts were characterized, finding that fathers self-disclosed a range of individual, familial, and societal stressors, including topics sensitive to traditional male gender roles. Second, peers' comments were differentiated by support type, with differences observed in the behaviors, emotions, and language that peers use when providing advice, confirmation and encouragement. Third, the relationship between types of fatherhood stressors and their associated peer comments was mapped. While fathers seeking support for individual stressors received fewer comments, the support provided utilized more action-oriented language. Finally, a statistical model was developed to examine the factors that drive peer support on the fatherhood forums, which are observed to influence the quality of peers' comments and peers' commenting behaviors. Combined, the findings provide a comprehensive understanding of the peer support environment for fathers on social media like Reddit, strengthening the research literature that is limited to qualitative evidence to date. The results have important implications for formal support services targeting fathers, both online and offline.

Keywords: peer support, fatherhood, parenting

1 Introduction

The transition to parenthood is characterized by a multitude of psychological stressors for mothers and fathers alike, including changes to role identity, relationship dynamics, issues around infant bonding, the acquisition of parenting skills, and emotional adjustment (Singley & Edwards, 2015; Taubmanben-Ari, Shlomo, Sivan, & Dolizki, 2009). Supporting new parents through this critical time can assist in establishing the foundations for healthy family functioning and child development. While health care professionals offer formal support to parents, research has identified several barriers that make fathers less likely to engage in formal support when compared to mothers. These barriers include a lack of father-specific support options available, the perceived indifference of fathers in engaging in perinatal care, difficulty accessing formal support around work commitments, and fathers' own lack of help-seeking (Bateson, Darwin, Galdas, & Rosan, 2017; Wong et al., 2016).

Beyond formal support, the informal social and emotional support of peers has been shown to be an invaluable supplementary support strategy for parents, and particularly useful for fathers (Friedewald, Fletcher, & Fairbairn, 2005; Niela-Vilén, Axelin, Salanterä, & Melender, 2014; O'Brien et al., 2017). The availability of peer support online can provide fathers with opportunities to connect with peers experiencing similar stressors to themselves (e.g. adolescent fathers (Johansson & Hammarén, 2014)), discuss issues not covered in formal support (e.g., fathers' roles (Friedewald et al., 2005)), and access experience-based advice at anytime, anywhere. In a rich qualitative analysis of an online fatherhood forum, Eriksson and Salzmänn-Erikson (2013) identified three main categories of peer support in operation: (1) *encouragement*, where peers communicated confidence, hope and motivation to continue with fathers' caregiving activities and their caregiver role; (2) *confirmation*, where peers shared their experiences as fathers to confirm their caring ability with each other; and (3) *advice*, where peers shared relevant information and knowledge to address specific challenges. However, their analytic method limited their ability to quantify the nature of these types of peer support to develop a replicable model of supportive fatherhood online environments. Nevertheless, this conceptualization of fathers' online peer support behaviors provides a strong initial foundation for further examination (Doty & Dworkin, 2014).

While numerous qualitative studies exist describing the content of discussions on fatherhood forums (e.g., Ammari & Schoenebeck, 2015; StGeorge & Fletcher, 2011; Teague & Shatte, 2018), research delineating the mechanisms that drive peer support factors for different fatherhood stressors remains limited. Research mapping when peers are more likely to provide support such as advice, confirmation and encouragement to fathers' support-seeking posts would clarify the relationship between fatherhood stressors and peers' supportive messages. Further, peers on online forums may demonstrate additional supportive behaviors that are unable to be captured through the existing qualitative literature. This can include: how quickly peers respond to fathers' initial support-seeking posts (*responsiveness*); how long the discussion lasts (*duration*); how many peers participate in the discussion (*quantity*); the use of social media platform-specific rating systems on fathers' support-seeking posts, such as upvoting/downvoting, sharing, like-ing or other reactions (*score*); and the word length of peer comments (*depth*). Such behavioral factors have been found to moderate the effectiveness of tele-health interventions with other populations (e.g., SMS-based crisis support lines (Sindahl & van Dolen, 2020)), but

remain neglected in research examining informal online support for fathers. Further, natural language processing techniques can provide objective measures of affect and language attributes within both fathers' support-seeking posts and peer comments. Combined, considering the content, behavior, emotions and language attributes of fathers' support-seeking posts and peer comments may provide a more nuanced picture of how supportive peer environments emerge on online fatherhood forums.

Therefore, the current study aimed to examine the nature of peer support in online fatherhood forums, focusing on the stressors that fathers seek peers' support for; the language, content, behaviors, and emotions of peers' support; and the attributes that drive peers to provide support to fathers. More specifically, this study aimed to: (i) examine the content, behaviors, emotions and linguistic dimensions of fathers' online support-seeking posts; (ii) examine the quality of online peer support elicited by fathers' support-seeking posts, specifically the differences in the behaviors, emotions, and linguistic attributes of encouragement, confirmation and advice peer comments; (iii) map the relationship between types of fatherhood stressors and their associated online peer support comments, including the content, behaviors, emotions, and linguistic dimensions of peers' support; and (iv) examine the attributes of fathers' support-seeking posts that drive the content and behavior of peers' support. Combined, the study demonstrates a wholistic model of the nature of fathers' online peer support, which can assist in the effective design of peer support systems for fathers and equip health providers with more clarity around what support fathers are likely to receive through such online support groups.

2 Method

2.1 Data

Data for the current study were obtained from previous research by Teague and Shatte (2018), which examined discussions on two key fatherhood discussion forums on the social media platform Reddit. The authors utilized an unsupervised clustering algorithm to group discussion threads into 3 emergent categories containing a total of 9 discussion topics: (1) Expectant Fathers' Milestones, including *Pregnancy Milestones*, *Birth Announcements*, and *First-time Fathers*; (2) Fathers' Practices, including the topics of *Growing Up*, *Cute Pictures*, and *Paternal Bonding*; and (3) Fatherhood Challenges, covering the topics *Struggles*, *Budgets and Purchases*, and *Sleep*. For the current study, only discussions grouped under the Struggles topic were included for analysis to best capture fathers' self-reported stressors to the fatherhood forums. As the original dataset was grouped by discussion thread (i.e. original post and its comments combined), each original post was evaluated to confirm that the original author was seeking support for a fatherhood-related (as opposed to the overall discussion thread focusing on the struggles and challenges of fatherhood). This process resulted in a final dataset consisting of 369 original posts with 3,535 replies ($M=9.58$, $SD=12.23$ replies per original post), contributed by 2,393 unique users.

2.2 Measures

2.2.1 Fathers' Support-seeking Posts

2.2.1.1 Content

The stressors that fathers self-disclose was assessed using both quantitative and qualitative content analysis methods. Quantitative analysis was conducted using the Linguistic Inquiry and Word Count (LIWC) 2015 software (Pennebaker, Boyd, Jordan, & Blackburn, 2015). LIWC is a text analysis application developed to assess various emotional, cognitive, and structural components present in individuals' verbal and written speech samples. LIWC2015 dictionaries were selected based on previous research examining the content of discussions on the Reddit fatherhood forums (Ammari, Schoenebeck, & Romero, 2018; Teague & Shatte, 2018). Specifically, the dictionaries of family (e.g., daughter, dad, aunt), health (e.g., clinic, flu, pill), sexual (e.g., horny, love, incest), work (e.g., job, majors, xerox), leisure (e.g., cook, chat, movie), home (e.g., kitchen, landlord), money (e.g., audit, cash, owe), religion (e.g., altar, church), and death (e.g., bury, coffin, kill) were included.

Qualitative analysis of content in father's support-seeking posts was conducted using a content analysis. First, both authors familiarized themselves with the data by reading and reviewing all the fathers' support-seeking posts, noting their initial impressions (stage 1). The first author then assigned general codes to each fatherhood support-seeking post using an inductive approach (stage 2). Next, the authors discussed these general codes and emerging themes of fatherhood stressors (step 3). Codes were then developed into a thematic map (step 4), and definitions were given to key themes (step 5).

2.2.1.2 Behaviors, emotions and language attributes.

The behavior, emotion and language attributes of fathers' support-seeking posts were assessed using the LIWC2015 dictionary (Pennebaker et al., 2015). Specifically, behavior was assessed using the total word count and number of words per sentence; emotion was assessed using positive and negative affect dictionaries, and linguistic attributes were assessed using the following linguistic dimensions and other grammar dictionaries: articles, auxiliary verbs, conjunctions, adverbs, impersonal pronouns, personal pronouns, prepositions, functional words, fillers, assent, negation, and quantifiers. Informal language was also assessed via swear words, "netspeak" (e.g. btw, lol, thx), assent (e.g., agree, OK, yes), nonfluencies (e.g., er, hm, umm), and fillers (e.g., I mean, youknow).

2.2.2 Peer Support

2.2.2.1 Content

Amazon Mechanical Turks (MTurks) were used to label each peer support comment following Eriksson and Salzman-Erikson's (Eriksson & Salzman-Erikson, 2013) three types of peer support identified in fatherhood forums: encouragement, confirmation, and advice. This framework was selected due to being designed specifically for the context of social support in fathers; there is growing evidence of different communities having different styles of social connection online, including differences in social support between predominantly male and female communities (Lin, Zhang, & Li, 2016). Each comment was rated by three separate

coders, with agreement determined by 2 or more MTurks selecting the same peer support type. Where no agreement was reached, the comment was not allocated to a peer support category. Agreement was reached for 3,309 peer comments (93.6%), with 226 comments excluded from further analysis after failure to reach consensus on peer support type.

2.2.2.2 Behaviors, emotions, and language attributes.

We also considered the broader peer support experience for the father by examining peer support factors within the overall discussion thread. Five peer commenting behaviors were examined, including (1) *responsiveness*, the time delay in seconds between the fathers' support-seeking post and the first comment in reply from the community; (2) *duration*, the total length of time in seconds from fathers' initial support-seeking post to the final comment on the discussion thread; (3) *quantity*, the number of comments the father received in response to their support-seeking post; (4) *score*, the 'score' that fathers' support-seeking post was awarded by the community (based on votes); and (5) *depth*, the word-length of peer comments. As per the father support-seeking posts, each peer support comment was assessed for the same emotion and language attributes using the LIWC2015 dictionaries; that is positive and negative affect, articles, auxiliary verbs, conjunctions, adverbs, impersonal pronouns, personal pronouns, prepositions, functional words, fillers, assent, negation, quantifiers, swear words, "netspeak", assent, nonfluencies, and fillers.

2.2.3 Analysis

All analyses relied on existing public data with nonidentifiable participants, adhered to Reddit's terms and conditions, and were exempted by the Federation University Human Research Ethics Committee. To address aim 1, a content analysis of fathers' support-seeking posts was conducted to identify the stressors (discussed above). One-way analysis of variance with Tukey post-hoc tests were then performed to examine differences in the content, behavior, emotion and language attributes of fatherhood stressor groups. For aim 2, one-way analysis of variance with Tukey post-hoc tests were performed to examine differences in the behavior, emotion and language attributes of peer support comment types (advice, confirmation and encouragement). For aim 3, differences in the overall peer support discussion thread received for each fatherhood stressor were assessed using one-way analysis of variance with Tukey post-hoc tests. Finally, for aim 4, negative binomial regressions were performed to examine how the content, behavior, emotions and language attributes of fatherhood stressors drive the quality (number of advice, confirmation and encouragement peer comments) and behavioral (responsiveness, duration, quantity, score and depth) aspects of peer support. A negative binomial model was selected as it is typically well-suited to handle over-dispersed count outcome variables. For all analyses, corrections for multiple testing were not conducted due to the exploratory nature of the research question, with actual p values and effect sizes reported. Effect sizes were interpreted using Cohen's rules, where effects of 0.01-0.05 are considered small, 0.06-0.13 are medium-sized, and 0.14 or greater are large (Cohen, 1988).

3 Results

3.1 Characterizing Father's Support-Seeking Posts

3.1.1 Content

Qualitative analysis identified three overarching themes consisting of eight subcategories: (1) individual stressors (n=66) included fathers' own experiences of *negative mood or affect* and *challenging fatherhood contexts*; (2) family stressors (n=215) included issues with *fertility, pregnancy and childbirth, relationships with the partner* (typically the mother), and *relationships with children*; and (3) broader societal stressors (n=88) included issues with the *role transition and new identity, work/life balance, and the extended social network* of broader family, friends, and neighbors. First, individual stressors involved support-seeking posts that focused on fathers' own personal characteristics, including negative mood or affect (e.g., feelings of loss, fear, stress, uselessness, loneliness, anxiety or depression; n=52) and connecting with others in similar challenging fatherhood contexts (e.g., single dads, stay-at-home dads, co-parenting/mixed families, gay parents, first-time fathers; n=14).

Second, family stressors involved challenges in the immediate-family microsystem of father, partner and child/ren, including: fathers' relationship with their partner (e.g., communication difficulties, supporting mothers with mental health issues, and issues with sexual relations; n=47); fathers' relationship with their child/ren (e.g., bonding, father-infant interaction, and parenting skills; n=51); and issues around fertility, pregnancy and birth (e.g., pregnancy complications, difficulty conceiving, traumatic childbirths, miscarriage; n=117). Finally, broader societal stressors involved fathers' challenges with how their father role fit within their broader relationships and environments, including: adjusting to their new role as a father (e.g., loss of individual identity, lifestyle adjustment, feeling alienated in caregiving activities by strangers and healthcare systems; n=27); managing the competing interests of work and home life (e.g., childcare, accessing parental leave, financial stressors; n=38); and experiencing issues with their extended social network (e.g., extended family, pets, friends and neighbors; n=23).

Content differences between the individual, family, and broader societal stressors were also identified in the quantitative analysis (see Table 1). Differences were observed between stressor groups in themes on family, health, work, leisure, home and money. Specifically, the broader societal stressor group contained more family terms than the family stressor group ($p=.01$), and more work, home and money terms than the individual stressor group ($p<.01$; $p<.01$; and $p<.001$, respectfully). The family stressor group contained more health terms than the broader societal stressor group ($p=.02$).

3.1.2 Behavior, emotion and language attributes

Between stressor groups, the broader stressor group was found to have more words per sentence and prepositions than the family stressor group ($p=.02$ and $p<.01$, respectfully) (see Table 1). The individual stressor group used more auxiliary verbs than the family group, and more adjectives than the broader stressor group ($p<.01$ and $p=.01$). Finally, the family stressor group used more assent terms than the broader societal stressor group ($p=.03$). No differences in emotions were observed between stressor groups.

Table 1

Differences in the content, behavior, emotion and linguistic attribute between stressor types

	Stressor Type (<i>M</i> (<i>SD</i>))			Comparisons		
	Individual (<i>n</i> =66)	Family (<i>n</i> =215)	Broader (<i>n</i> =88)	<i>f</i> (2,366)	<i>p</i>	η^2
<i>Content</i>						
Family	3.05 (1.98)	2.74 (2.17)	3.54 (2.36)	4.25	0.01	0.02
Health	1.33 (1.32)	1.48 (1.73)	0.96 (1.15)	3.61	0.03	0.02
Sexual	0.5 (0.92)	0.43 (0.81)	0.23 (0.52)	2.86	0.06	0.02
Work	1.28 (1.35)	1.35 (1.79)	2.18 (2.26)	7.13	<.01	0.04
Leisure	0.58 (0.72)	0.54 (0.94)	0.87 (1.26)	3.53	0.03	0.02
Home	0.42 (0.66)	0.36 (0.59)	0.83 (1.14)	12.04	<.001	0.06
Money	0.33 (0.63)	0.19 (0.53)	0.88 (1.6)	17.61	<.001	0.09
Religion	0.06 (0.23)	0.15 (0.76)	0.06 (0.17)	1.09	0.34	0.01
Death	0.11 (0.47)	0.06 (0.23)	0.03 (0.15)	1.45	0.24	0.01
<i>Behaviors</i>						
Total word count	178.52 (161.34)	200.47 (203.41)	188 (163.83)	0.4	0.67	<.01
Words per sentence	14.79 (4.79)	14.85 (5.14)	16.69 (6.06)	4.09	0.02	0.02
<i>Emotions</i>						
Positive affect	3.27 (2.24)	3.25 (2.74)	2.62 (1.65)	2.32	0.10	0.01
Negative affect	2.65 (1.98)	2.48 (2.06)	1.97 (1.87)	2.69	0.07	0.01
<i>Linguistic Dimensions</i>						
Functional	57.28 (7.17)	55.6 (6.52)	56.58 (5.76)	1.99	0.14	0.01
Personal pronouns	12.01 (3.46)	12.02 (4.33)	12.53 (3.12)	0.57	0.56	<.01
Impersonal pronouns	5.9 (2.34)	5.3 (2.82)	5.31 (2.71)	1.34	0.26	0.01
Articles	5.16 (2.49)	5.3 (2.8)	5.08 (2.15)	0.25	0.77	<.01
Prepositions	12.67 (2.93)	12.48 (3.46)	13.78 (3.18)	4.91	<.01	0.03
Auxillary verbs	11.86 (3.3)	10.08 (3.58)	10.55 (3.48)	6.48	<.01	0.03
Adverbs	6.47 (2.81)	6.01 (3.18)	6.34 (3.38)	0.71	0.49	<.01
Conjunctions	7.2 (2.69)	7.05 (2.65)	7.25 (3)	0.19	0.82	<.01
Negation	2.56 (2.27)	2.62 (2.9)	2.27 (2.63)	0.51	0.60	<.01
Verbs	19.71 (4.16)	18.89 (5.24)	19.49 (3.56)	1.03	0.36	0.01
Adjectives	5.51 (3.01)	4.84 (3.01)	4.16 (2.25)	4.3	0.01	0.02
Quantifiers	3.49 (3.16)	3.29 (3.16)	2.97 (2.33)	0.62	0.53	<.01
Swear	0.2 (0.41)	0.28 (0.62)	0.27 (0.66)	0.53	0.59	<.01
Netspeak	0.32 (0.7)	0.28 (1.42)	0.18 (0.37)	0.36	0.70	<.01
Assent	0.11 (0.27)	0.14 (0.32)	0.05 (0.14)	3.13	0.04	0.02
Nonfluencies	0.12 (0.29)	0.17 (0.74)	0.13 (0.27)	0.25	0.78	<.01
Filler	0.04 (0.17)	0.02 (0.11)	0.05 (0.21)	1.02	0.36	0.01
Questioning	1.27 (2.04)	1.27 (2.68)	1.33 (1.65)	0.02	0.98	<.01

3.2 Characterizing Peers' Support Comments

A total of $n=1209$ advice, $n=1285$ confirmation, and $n=815$ encouragement comments were identified in peers' responses to fathers' stressors (see Table 2). Advice peer comments differed from both confirmation and encouragement comments, including having a longer word count ($p=.001$; $p<.001$, respectively), using fewer personal pronouns ($p<.001$ for both) and adjectives ($p=.001$; $p<.001$, respectively), and more articles ($p<.001$ for both) and questions ($p=.01$; $p=.03$, respectively). Advice comments were further distinct from encouragement comments, specifically in their use of more conjunctions and fewer swear words ($p=.02$; $p=.01$, respectively).

By contrast, encouragement peer comments differed from advice and confirmation comments in their shorter word count and use of fewer words per sentence ($p<.001$ for all). Encouragement comments were further distinct from advice and confirmation comments by the use of more emotive language ($p<.001$ for both positive and negative emotions for all), fewer functional, article, preposition, and negation linguistic attributes ($p<.001$ for all), and more personal pronouns, adjectives, and assent attributes ($p<.001$ for all). Finally, confirmation peer comments appeared had overlapping features with advice comments but differed in several ways. Compared with advice comments, confirmation comments contained a smaller word count ($p=.001$), more personal pronouns, adverbs and adjectives, and fewer articles ($p<.001$, $p=.001$, $p=.001$, $p<.001$, respectively).

3.3 Differences in Peer Support Comments between Fatherhood Stressors

Several differences were observed in peer comments received on fathers' posts regarding different types of fatherhood stressors (see Table 3). Fathers' posts regarding individual stressors received fewer comments than those regarding family stressors ($p=.04$), and the comments contained more function words and verbs than comments on posts regarding family stressors ($p<.01$ and $p=.01$, respectively). Further, comments on posts regarding individual stressors contained more auxiliary verbs than posts regarding both family and broader societal stressors ($p<.001$ and $p<.01$, respectively). Differences were also observed between the comments on family and broader stressor posts; comments on family stressor posts contained more adjectives ($p<.01$), and comments on broader societal stressor posts contained more personal pronouns ($p<.01$).

Table 2

Differences in the behavior, emotion and linguistic attributes between peer support types

	Peer Support Type (<i>M</i> (<i>SD</i>))			Comparisons		
	Advice (<i>n</i> =1,209)	Confirmation (<i>n</i> =1,285)	Encouragement (<i>n</i> =815)	<i>f</i> (2,3532)	<i>p</i>	η^2
<i>Behaviors</i>						
Total word count	102.3 (109.29)	89.41 (91.14)	39.49 (51.13)	123.94	<.001	0.07
Words per sentence	15.19 (7.42)	14.6 (7.05)	9.59 (5.6)	185.11	<.001	0.10
<i>Emotions</i>						
Positive affect	3.66 (3.4)	3.56 (4.22)	9.37 (11.12)	245.91	<.001	0.13
Negative affect	2.06 (3.23)	2.36 (3.66)	4.09 (7.26)	50.42	<.001	0.03
<i>Linguistic Dimensions</i>						
Functional	54.8 (10.02)	55.33 (9)	51.46 (15.08)	33.09	<.001	0.02
Personal pronouns	10.64 (5.52)	11.92 (5.27)	13.75 (8.69)	58.07	<.001	0.03
Impersonal pronouns	5.82 (4.28)	5.93 (4.24)	5.63 (5.8)	1.02	0.36	<.01
Articles	6.06 (3.87)	5.43 (3.46)	4.3 (4.72)	48.46	<.001	0.03
Prepositions	12.48 (4.94)	12.29 (4.89)	10.87 (6.89)	23.87	<.001	0.01
Auxillary verbs	10.41 (5.23)	10.27 (4.68)	9.75 (7.83)	3.32	0.04	<.01
Adverbs	5.66 (4.02)	6.31 (4.21)	5.77 (6.58)	6.38	<.01	<.01
Conjunctions	7.17 (3.85)	6.95 (3.98)	6.45 (6.12)	6.09	<.01	<.01
Negation	2.1 (2.73)	2.09 (2.73)	1.47 (2.68)	16.27	<.001	0.01
Verbs	19.12 (7)	19.07 (6.11)	19.46 (10.07)	0.73	0.48	<.01
Adjectives	4.91 (3.92)	5.66 (4.57)	7.58 (7.66)	63.32	<.001	0.04
Quantifiers	2.4 (2.56)	2.46 (2.39)	2.26 (4.22)	1.17	0.31	<.01
Swear	0.3 (1.67)	0.37 (1.65)	0.54 (2.34)	4.26	0.01	<.01
Netspeak	0.53 (2.67)	0.59 (3.04)	0.82 (3.49)	2.43	0.09	<.01
Assent	0.21 (0.8)	0.23 (0.86)	0.52 (2.38)	14.33	<.001	0.01
Nonfluencies	0.17 (0.91)	0.24 (1.76)	0.32 (2.38)	1.86	0.16	<.01
Filler	0.03 (0.21)	0.03 (0.25)	0.02 (0.29)	1.36	0.26	<.01
Questioning	1.04 (6.87)	0.5 (3.41)	0.54 (2.99)	4.4	0.01	<.01

Table 3

Differences in peer support factors between stressor types

Peer Support	Stressor Type (<i>M</i> (<i>SD</i>))			Comparisons		
	Individual (<i>n</i> =66)	Family (<i>n</i> =215)	Broader (<i>n</i> =88)	<i>f</i> (2,366)	<i>p</i>	η^2
<i>Content</i>						
Advice	2.71 (2.71)	3.41 (4.91)	3.38 (3.21)	0.72	0.49	<.01
Confirmation	2.35 (2.5)	3.5 (5.05)	4.3 (6.62)	2.71	0.07	0.01
Encouragement	0.91 (3.36)	3.06 (9.52)	1.11 (3.41)	3.21	0.04	0.02
<i>Behaviors</i>						
Responsiveness	15702.89 (55431.11)	7357.62 (22821.66)	7601.32 (30937.41)	1.72	0.18	0.01
Score	54.05 (276.92)	77.23 (237.31)	46.67 (169.51)	0.65	0.52	<.01
Depth	637 (536.92)	731.71 (720.76)	811.31 (798.19)	1.13	0.32	0.01
Duration	169013.05 (257390.05)	164441.09 (224647.46)	141995.92 (193162.31)	0.38	0.68	<.01
Quantity	5.97 (5.23)	9.96 (13.67)	8.78 (9.66)	2.97	0.05	0.02
<i>Emotions</i>						
Positive affect	4.27 (2.65)	5.18 (4.32)	4.03 (5.22)	2.7	0.07	0.01
Negative affect	2.11 (1.41)	2.22 (1.8)	2.11 (1.83)	0.19	0.82	<.01
<i>Linguistic Dimensions</i>						
Functional	56.82 (4.32)	53.57 (8.45)	55.34 (7.52)	5.13	0.01	0.03
Personal pronouns	11.67 (2.68)	10.8 (3.25)	12.41 (5.33)	5.95	<.01	0.03
Impersonal pronouns	6.21 (2.03)	5.74 (1.94)	5.66 (1.98)	1.74	0.18	0.01
Articles	5.77 (1.34)	5.46 (1.94)	5.53 (1.75)	0.73	0.48	<.01
Prepositions	12.36 (2.33)	12.1 (2.82)	12.7 (2.71)	1.53	0.22	0.01
Auxillary verbs	11.65 (2.5)	10.07 (2.79)	10.27 (2.44)	9.05	<.001	0.05
Adverbs	6.38 (1.71)	5.89 (2.14)	5.59 (1.81)	2.93	0.05	0.02
Conjunctions	7.57 (1.92)	6.96 (2.00)	6.95 (1.75)	2.77	0.06	0.01
Negation	1.97 (0.88)	1.89 (1.14)	1.91 (1.03)	0.14	0.87	<.001
Verbs	20.4 (3.09)	18.79 (4.11)	19.6 (4.59)	4.34	0.01	0.02
Adjectives	5.43 (1.84)	5.77 (2.81)	4.86 (1.74)	4.43	0.01	0.02
Quantifiers	2.7 (1.02)	2.44 (1.22)	2.31 (1.08)	2.16	0.12	0.01
Swear	0.26 (0.41)	0.34 (1.18)	0.43 (1.01)	0.49	0.61	<.01
Netspeak	0.37 (0.52)	0.50 (0.80)	0.57 (1.23)	0.96	0.38	0.01
Assent	0.17 (0.29)	0.40 (1.26)	0.20 (0.35)	2.14	0.12	0.01
Nonfluencies	0.17 (0.40)	0.22 (0.52)	0.24 (0.44)	0.42	0.66	<.01
Filler	0.04 (0.10)	0.02 (0.09)	0.02 (0.06)	0.61	0.55	<.01

3.4 Drivers of peer support to fathers' support-seeking posts

3.4.1 Peer support content

As shown in Table 4, a negative binomial regression model was developed for the total number of advice, confirmation and encouragement comments received on fathers' support-seeking posts, with each model achieving significant statistical power over baseline. Fathers' support-seeking posts that contained more netspeak and home-related terms were more likely to receive advice comments from their peers ($B=0.17, p=.04$ and $B=0.12, p=.03$, respectively). Confirmation peer comments were more likely when fathers' support-seeking posts had content themes of sex and death ($B=0.19, p=.03$; $B=0.57, p=.01$); in contrast, confirmation peer comments were less likely when fathers' support-seeking posts had higher negative affect, and discussion themes around work, family, leisure, and health ($B=-0.09, p<.01$; $B=-0.10, p<.01$; $B=-.09, p<.01$; $B=-0.17, p=.01$; and $B=-0.08, p=.05$, respectively). Further, posts that focused on individual or societal-level fatherhood stressors received fewer confirmation comments from their peers than those discussing family-level stressors ($B=-.52, p=.02$; $B=-.46, p=.03$, respectively).

Finally, encouragement comments were more commonly received on father's support-seeking posts with more money and health-related terms ($B=0.21, p<.01$ and $B=0.14, p<.01$), while those with more leisure and sexual-related terms received fewer encouragement comments ($B=-0.21, p=.03$ and $B=-0.27, p=.03$). Support-seeking posts focused on individual and societal fatherhood stressors received fewer encouragement comments than family stressors ($B=-0.52, p=.02$ and $B=-0.46, p=.03$). Finally, posts that were characterized by having more personal pronouns and negations with fewer auxiliary verbs, conjunctions, verbs, quantifiers and words per sentence received more encouragement comments ($B=0.05, p=.03$; $B=0.09, p=.03$; $B=-0.07, p=.01$; $B=-0.08, p=.01$; $B=-0.04, p=.08$; $B=-0.09, p=.03$; and $B=-0.06, p=.001$, respectively).

3.4.2 Peer support behaviors

A negative binomial model was developed to predict the responsiveness, duration, quantity, score and depth of peer comments (see Table 5). Significant statistical power over baseline was achieved for each model of peer support behaviors except for peers' comment depth (Likelihood Ratio $\chi^2(23,369)=20.00, p=0.64$). Fathers' support-seeking posts received more responsive peer comments when they contained more family, home, and health terms ($B=.07, p=.04$; $B=.11, p<.01$; and $B=.21, p<.001$, respectively), as well as more prepositions and auxiliary verbs ($B=.10, p<.001$ and $B=.08, p<.01$, respectively). Peers were also more responsive to support-seeking posts regarding individual stressors than family stressors ($B=0.78, p<.001$). Conversely, peers were less responsive when fathers' support-seeking posts contained more words per sentence and verbs ($B=-.04, p<.01$; and $B=-.04, p=.05$, respectively).

Fathers' support-seeking posts initiated conversations of longer duration when the post contained more verbs and fewer negations ($B=.04, p=.02$ and $B=-.12, p<.001$, respectively), and received a higher quantity of peer comments when they contained less health-related terms and more negations ($B=-.07, p=.03$ and $B=.06, p=.05$, respectively). Fatherhood support-seeking posts regarding individual stressors received a lower quantity of peer comments than those regarding family stressors ($B=-.38, p=.02$). Finally, peers attributed a higher score to fathers' support-seeking posts when they contained more content themes of leisure and death and more negations ($B=.28, p<.001$; $B=.50, p<.01$; and $B=0.22, p<.001$, respectively), along with fewer

content themes of health, sex and work, with fewer prepositions, auxiliary verbs, and verbs ($B=-.09, p=.02$; $B=-.20, p<.01$; $B=-.33, p<.001$; $B=-0.09, p<.001$; $B=-0.08, p<.001$; $B=-0.04, p=0.05$).

Table 4

Features from fathers' support-seeking posts driving the content of peers' comments

Support-seeking post features	Advice					Confirmation					Encouragement				
	$\chi^2_{(23,369)}$	<i>B</i>	SE <i>B</i>	<i>p</i>	<i>e</i> ^b	$\chi^2_{(23,369)}$	<i>B</i>	SE <i>B</i>	<i>p</i>	<i>e</i> ^b	$\chi^2_{(23,369)}$	<i>B</i>	SE <i>B</i>	<i>p</i>	<i>e</i> ^b
<i>Model performance</i>	44.84			0.004		84.47			<.001		276.23			<.001	
<i>Stressor Category</i>															
Family		0 ^a			1.00		0 ^a			1.00		0 ^a			1.00
Individual		-0.29	0.18	0.10	0.75		-0.33	0.17	0.06	0.72		-0.52	0.22	0.02	0.59
Societal		0.01	0.17	0.95	1.01		0.42	0.17	0.02	1.52		-0.46	0.22	0.03	0.63
<i>Content</i>															
Family		0.04	0.03	0.17	1.05		-0.09	0.03	<.01	0.91		0.01	0.03	0.84	1.01
Work		-0.04	0.04	0.33	0.96		-0.10	0.04	<.01	0.90		-0.04	0.05	0.37	0.96
Leisure		0.06	0.06	0.32	1.06		-0.17	0.07	0.01	0.85		-0.21	0.10	0.03	0.81
Home		0.17	0.08	0.04	1.18		-0.12	0.08	0.14	0.88		-0.12	0.10	0.26	0.89
Money		-0.11	0.07	0.14	0.90		0.10	0.06	0.13	1.10		0.21	0.08	0.01	1.23
Health		0.01	0.04	0.88	1.01		-0.08	0.04	0.05	0.92		0.14	0.05	<.01	1.15
Sexual		-0.08	0.09	0.39	0.93		0.19	0.09	0.03	1.21		-0.27	0.12	0.03	0.76
Religion		0.12	0.09	0.20	1.12		0.12	0.1	0.21	1.13		0.08	0.14	0.58	1.08
Death		-0.48	0.28	0.09	0.62		0.57	0.22	0.01	1.76		0.29	0.25	0.24	1.34
<i>Behavior</i>															
Total word count		<.01	<.01	0.40	1.00		<.01	<.01	0.11	1.00		<.01	<.001	<.001	1.00
Words per sentence		<.01	0.01	0.80	1.00		<.01	0.02	0.91	1.00		-0.06	0.02	<.01	0.94
<i>Emotions</i>															
Positive affect		-0.01	0.03	0.64	0.99		0.02	0.03	0.46	1.02		0.01	0.03	0.77	1.01
Negative affect		0.04	0.03	0.18	1.04		-0.09	0.03	<.01	0.91		0.02	0.04	0.69	1.02
<i>Linguistic attributes</i>															
Personal pronouns		0.02	0.02	0.32	1.02		0.02	0.02	0.31	1.02		0.05	0.02	0.03	1.05
Prepositions		0.00	0.02	0.97	1.00		-0.03	0.02	0.26	0.98		-0.03	0.03	0.29	0.97
Auxillary verbs		0.05	0.03	0.07	1.05		-0.04	0.02	0.10	0.96		-0.07	0.03	<.01	0.93
Conjunctions		0.01	0.02	0.73	1.01		0.02	0.03	0.55	1.02		-0.08	0.03	<.01	0.92
Negations		0.02	0.03	0.45	1.02		0.04	0.03	0.18	1.04		0.09	0.04	0.03	1.09
Verbs		-0.02	0.02	0.31	0.98		0.02	0.02	0.25	1.02		-0.04	0.02	0.08	0.96
Quantifiers		0.01	0.03	0.72	1.01		0.01	0.04	0.83	1.01		-0.09	0.04	0.03	0.92
Netspeak		0.12	0.05	0.03	1.13		-0.09	0.06	0.12	0.92		0.04	0.07	0.61	1.04

NOTES: ^aSet to zero because this variable is redundant. It is the comparable variable. *B* = unstandardised beta; SE *B* = the standard error for the unstandardised beta; *e*^b = exponential beta, or incident rate ratio (IRR). Model performance compared with the null (intercept-only) model.

Table 5

Features from fathers' struggle social media posts driving peers' commenting behaviors

Support-seeking post features	Responsiveness					Duration					Quantity					Score				
	$\chi^2_{(23,369)}$	<i>B</i>	SE <i>B</i>	<i>p</i>	<i>e</i> ^b	$\chi^2_{(23,369)}$	<i>B</i>	SE <i>B</i>	<i>p</i>	<i>e</i> ^b	$\chi^2_{(23,369)}$	<i>B</i>	SE <i>B</i>	<i>p</i>	<i>e</i> ^b	$\chi^2_{(23,369)}$	<i>B</i>	SE <i>B</i>	<i>p</i>	<i>e</i> ^b
<i>Model Performance</i>	221.37			<.001		47.28			<.01		67.9			<.001		565.88			<.001	
<i>Stressor Category</i>																				
Family		0 ^a			1.00		0 ^a			1.00		0 ^a			1.00		0 ^a			1.00
Individual		0.78	0.16	<.001	2.17		0.09	0.15	0.57	1.09		-0.38	0.16	0.02	0.68		-0.01	0.17	0.94	0.99
Societal		-0.14	0.16	0.40	0.87		-0.02	0.16	0.90	0.98		0.05	0.16	0.76	1.05		-0.02	0.16	0.92	0.98
<i>Content</i>																				
Family		0.07	0.03	0.04	1.07		-0.04	0.03	0.19	0.96		-0.01	0.03	0.73	0.99		-0.04	0.03	0.14	0.96
Health		0.11	0.04	<.01	1.11		0.03	0.03	0.31	1.03		-0.07	0.03	0.03	0.93		-0.09	0.04	0.02	0.92
Sexual		0.10	0.07	0.15	1.10		-0.09	0.05	0.11	0.92		-0.07	0.06	0.20	0.93		-0.2	0.06	<.01	0.82
Work		-0.13	0.07	0.07	0.88		0.08	0.08	0.32	1.08		-0.01	0.07	0.92	0.99		-0.33	0.08	<.001	0.72
Leisure		0.14	0.08	0.07	1.15		-0.07	0.07	0.28	0.93		0.07	0.06	0.22	1.08		0.28	0.06	<.001	1.33
Home		0.21	0.05	<.001	1.23		-0.02	0.04	0.63	0.98		0.02	0.04	0.64	1.02		0.03	0.04	0.43	1.03
Money		-0.13	0.08	0.10	0.87		0.15	0.08	0.08	1.16		-0.01	0.08	0.85	0.99		-0.11	0.08	0.16	0.90
Religion		0.04	0.13	0.76	1.04		0.07	0.12	0.54	1.07		0.08	0.09	0.42	1.08		-0.02	0.10	0.82	0.98
Death		-0.21	0.21	0.31	0.81		0.12	0.19	0.51	1.13		0.24	0.21	0.25	1.27		0.50	0.19	0.01	1.65
<i>Behavior</i>																				
Total word count		<.01	<.001	<.001	1.00		<.001	<.001	0.27	1.00		<.001	<.001	0.86	1.00		<.01	<.001	0.06	1.00
Words/sentence		-0.04	0.01	<.01	0.96		<-.01	0.01	0.77	1.00		-0.02	0.01	0.18	0.98		-0.05	0.01	<.001	0.95
<i>Emotions</i>																				
Positive affect		-0.05	0.03	0.12	0.96		0.01	0.03	0.78	1.01		0.01	0.03	0.84	1.01		0.04	0.03	0.2	1.04
Negative affect		-0.01	0.03	0.73	0.99		-0.01	0.03	0.7	0.99		-0.03	0.03	0.22	0.97		-0.11	0.03	<.001	0.89
<i>Linguistic attributes</i>																				
Personal pronouns		-0.03	0.02	0.13	0.97		-0.02	0.02	0.21	0.98		0.02	0.02	0.14	1.02		0.02	0.02	0.23	1.02
Prepositions		0.10	0.02	<.001	1.11		-0.03	0.02	0.14	0.97		-0.02	0.02	0.43	0.98		-0.09	0.02	<.001	0.91
Auxillary verbs		0.08	0.03	<.01	1.08		-0.02	0.02	0.48	0.98		0.00	0.02	0.9	1.00		-0.08	0.02	<.001	0.92
Conjunctions		0.01	0.03	0.63	1.01		0.03	0.02	0.21	1.03		-0.02	0.02	0.37	0.98		-0.04	0.02	0.06	0.96

Negations	-0.04	0.03	0.08	0.96	-0.12	0.03	<.001	0.89	0.06	0.03	0.05	1.06	0.22	0.03	<.001	1.25
Verbs	-0.04	0.02	0.05	0.96	0.04	0.02	0.02	1.05	-0.02	0.02	0.32	0.98	-0.04	0.02	0.05	0.96
Quantifiers	0.04	0.03	0.24	1.04	0.05	0.03	0.15	1.05	-0.02	0.03	0.54	0.98	-0.06	0.03	0.08	0.94
Netspeak	0.17	0.10	0.08	1.19	0.00	0.05	0.96	1.00	0.01	0.05	0.8	1.01	-0.11	0.09	0.24	0.90

NOTES: ^aSet to zero because this variable is redundant. It is the comparable variable. *B* = unstandardised beta; *SE B* = the standard error for the unstandardised beta; *e^b* = exponential beta, or incident rate ratio (IRR). Model performance compared with the null (intercept-only) model.

4 Discussion

This study explored the relationship between fatherhood stressors and peer support in an online social media environment, focusing on the content, behaviors, emotions and language attributes of fathers' posts and peer comments. Overall, we found that the fatherhood communities on social media are providing fathers with important informal peer support across the parenthood transition. Fathers' self-disclosed a range of individual, family, and broader societal stressors in online forums, which solicited differences in peers' reply comment quality and behaviors. In so doing, this study contributes to the growing literature on parent peer support online. This research particularly complements previous qualitative research on online fatherhood communities by using a mixed-methods design to examine both qualitative and quantitative differences in fathers' stressors and peer support. Such research has important implications for the design and delivery of peer support interventions for fathers both online and offline.

We first investigated the stressors that fathers' sought support for from informal online peer support forums. We identified that fathers self-disclosed a range of stressors in their support-seeking posts, which were categorized as individual, family, and broader societal stressors. This included sensitive topics for traditional male gender roles, such as mental health challenges, relational difficulties with partners, and complications with fertility, pregnancy and childbirth. Further, we identified fathers in challenging contexts who were looking to connect with others in similar circumstances, including single fathers, mature-age fathers, and co-parenting fathers. These findings suggest that fathers may overcome many of the barriers impeding their access to traditional perinatal support through online peer forums, including stigma around their caregiving role and discussion of mental health issues (Bateson et al., 2017; O'Brien et al., 2017). Further, sharing stressors with peers online offers fathers the ability to find and connect with others in similar contexts, which may not be possible in face-to-face peer support groups. Online peer support groups may thereby offer fathers a unique environment to share the challenges around the parenthood transition and may be an important complementary support strategy for formal perinatal health services. Reddit may be a particularly useful social media site for fathers to overcome stigma around help-seeking and their caregiving role, given its anonymous nature (Ammari & Schoenebeck, 2015; Shatte, Hutchinson, Fuller-Tyszkiewicz, & Teague, 2020; Teague & Shatte, 2018).

Second, we investigated the content and behaviors of peers' support on the fatherhood forums, with important findings for the conceptualization of how fathers seek and support each other online. Encouraging comments were less common than both confirmation and advice comments and were characterized by shorter length and more emotional and personal language. By contrast, advice and confirmation comments were both very common and had many overlapping features, including similar sentence lengths, assent, negation, and emotive language. Several small differences were observed between confirmation and advice peer comments, including advice comments being longer and containing more questions, and confirmation comments using more descriptive and personal language. These results could suggest that advice and confirmation peer support are subtypes of a broader informational support category. Fathers may prefer providing and receiving informational support over emotional support like encouragement to problem-solve their stressors. Such findings are consistent with clinical recommendations for supporting fathers' mental health, where action-oriented language and

goal-driven approaches are found to be more effective and engaging with male clients (Seidler, Rice, Ogrodniczuk, Oliffe, & Dhillon, 2018). These findings could assist in the design of support services for fathers by providing facilitators with clear guidelines on how to adjust their messaging to match fathers' natural style. Digital support services that use written messaging to communicate with fathers would particularly benefit from tailoring their messages further, for example SMS-based support services (e.g., Fletcher et al., 2016).

Finally, we examined the relationship between fathers' support-seeking posts and the peer support they received. Fathers seeking support for an individual stressor, such as negative affect or challenging fatherhood contexts (e.g., single fathers), received fewer comments from peers than fathers seeking support for family or broader societal stressors. This could suggest that peers are not well-equipped to provide support for individual stressors, perhaps due to their more complex and less common nature. Importantly, peer comments that were provided on individual stressors had a faster response time and were characterized by more active-oriented language (e.g. verbs, auxiliary verbs), which follows clinical recommendations for assisting fathers with mental health issues. Nevertheless, health professionals working with fathers in the perinatal period should be mindful of the limitations of online peer support groups for fathers' negative affect and challenging fatherhood contexts and provide additional support to best meet fathers' needs. This may include moderating fatherhood forums to provide support for posts that the community may find challenging to respond to, either by referring the father to a formal support service or by modelling appropriate informal peer support to the community. These limitations in online peer support forums may also be found in offline peer support groups and may similarly benefit from added involvement from facilitators.

Beyond informing the design of current fatherhood support systems (discussed above), the current study has important implications for the design of future artificial intelligence support tools for fathers. The current study developed classifications of fatherhood stressors and peer support content and behaviors, which may be useful for machine-based analysis of unstructured interactions with fathers. The findings also demonstrate that peers' commenting behaviors are predictable from fathers' initial support-seeking post by extracting their content, behavior, emotional, and linguistic features. Combined, a future direction for researchers could be to explore whether automated systems can be developed that are able to identify fathers' stressors and generate appropriate supportive responses (Medeiros & Bosse, 2018). Such personalized digital systems are likely to be appealing to both fathers and perinatal healthcare services alike, given fathers preference for digital health support and the practicality of providing tailored support to this large, underserved population (Bateson et al., 2017; Mackert et al., 2018; Wong et al., 2016).

The current study has several limitations that should be considered when interpreting the findings. First, the data was collected from two fatherhood forums on the social media platform Reddit. While Reddit is a widely used international website, the userbase is biased toward English-speaking, North American men, which may limit its generalizability to other cultural settings (Duggan & Smith, 2013; Reddit, 2017). Social norms around fatherhood, family, gender roles, and masculinity across cultures may result in different content, behaviors, emotions, and linguistic attributes in both the stressors that fathers disclose and the support that peers may provide (Shwalb, Shwalb, & Lamb, 2013). Future research could explore whether the findings

from the current study are also identified on other social media platforms with different userbases. Second, the current study would benefit from the addition of ground truth data to verify the research findings. While membership of a fatherhood forum assumes that participants identify as fathers, this cannot be verified on anonymous platforms such as Reddit. Future work can address this limitation by combining fathers online and offline data and may seek to extend the current study further by delineating whether different peer support elements influence fathers' postpartum adjustment and wellbeing.

In conclusion, the current study demonstrates, to the best of our knowledge, the first comprehensive exploration of fathers' online support-seeking and peer support using a rich mixed-methods design. Fathers self-disclosed a considerable array of perinatal stressors, challenging traditional masculine social norms that typically impede men from seeking support through offline avenues. Different types of peer support were characterized, including peers' commenting content (encouragement, advice, and confirmation) and behaviors (responsiveness, duration, quantity, depth, and score), which were elicited by different content, behavior, emotion and linguistic attributes within fathers' support-seeking posts. The findings demonstrate how informal online peer support forums provide unique emotional and informational support to fathers – an overlooked and underserved population who face significant barriers in accessing perinatal care. The findings have important implications for the effective design of perinatal support for fathers by health practitioners, clinicians, researchers and policymakers.

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