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Parental Mentalizing During a Pandemic: Use of Mental State Language on Parenting Social Media
Before and During the COVID-19 Pandemic

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Abstract

The COVID-19 pandemic has been a demanding caregiving context for parents, particularly during lockdowns. This study examined parental mentalization, parents' proclivity to consider their own and their child's mental states, during the pandemic, as manifested in mental state language (MSL) on parenting social media. Parenting-related posts on Reddit from two time-periods in the pandemic in 2020, March-April (lockdown) and July-August (post-lockdown), were compared to time-matched control periods in 2019. MSL and self-other references were measured using text-analysis methods. Parental mentalization content decreased during the pandemic: parents referred less to mental activities and to others during the COVID-19 pandemic, and showed decreased affective MSL, cognitive MSL, and self-references specifically during lockdown. Fathers-specific subreddits exhibited strongest declines in mentalization content, whereas mothers-specific subreddits exhibited smaller changes. Implications on understanding associations between caregiving contexts and parental mentalization, gender differences, and the value of social media data to study parenting and mentalizing are discussed.

In the beginning of 2020, an outbreak of the SARS-CoV-2 virus and the spread of the coronavirus disease 2019 (hereafter, “COVID-19”) started changing the lives of individuals around the world. On March 11th, 2020 the World Health Organization declared COVID-19 a global pandemic. Physical distancing and/or lockdown restrictions were implemented, forcing people to stay at home, work from home, and socially isolate. This pandemic introduced a new caregiving context for many parents, including increased caregiving responsibilities with daycare and school closures, difficulty balancing caregiving and working from home, and adjustment to online learning (APA, 2020; Chartier, Delhalle, Baiverlin, & Blavier, 2021; Gassman-Pines, Ananat, & Fitz-Henley, 2020). Parental well-being is determined by the balance between positive rewarding parenting experiences (e.g., pride and joy) and parenting demands and stressors (Nelson, Kushlev, & Lyubomirsky, 2014; Nomaguchi & Milkie, 2020). The myriad of caregiving changes and demands introduced by the COVID-19 pandemic may “tip the balance” between rewards and demands in parenting and increase the risk for parental burnout (Mikolajczak, Gross, & Roskam, 2021). Moreover, physical distancing has reduced the availability of external social support, one of the main protective factors that help buffer against the hardships of parenting demands (Nelson et al., 2014; Nomaguchi & Milkie, 2020). Indeed, as a group, parents report higher rates of negative daily mood, stress, anxiety, and depression compared to non-parents during the pandemic and/or pre-pandemic levels (APA, 2020; Cameron et al., 2020; Gassman-Pines et al., 2020; Patrick et al., 2020; Racine et al., 2021), although parents’ experiences of emotional distress may vary at an individual level (Brown, Doom, Lechuga-Peña, Watamura, & Koppels, 2020). Consequently, parenting during the COVID-19 pandemic *can be contextualized as high in caregiving demands and stress*. As such, the pandemic may have a noticeable impact on family functioning.

Parenting stress and contexts of high caregiving demands are thought to interfere with parents’ attunement to their children (Deater-Deckard, 2005; Yatziv, Gueron-Sela, Meiri, Marks, & Atzaba-Poria, 2018), an ability supported by parental mentalization- parents’ proclivity to consider their child as a psychological agent and reflect on their own and their child’s mental states (Sharp & Fonagy, 2008). The change in caregiving context evoked by the COVID-19 pandemic may make it harder for parents to focus

on their child's and/or their partner's minds, perhaps as they are more occupied with their own worries or feel over-loaded with managing increased caregiving demands. As a global event impacting parents on a large scale, the pandemic can inform on the effects of stressful and demanding caregiving contexts on parenting in general, and mentalizing in specific. In this study, we examined whether social media content pertaining to parental mentalization changed during the COVID-19 pandemic by analyzing the content of parenting social media posts during the pandemic (2020) and equivalent periods in the year prior to the pandemic (2019). Specifically, as our measure of parental mentalization content, we focus on mental state language (MSL), which refers to language encapsulating mental states and internal processes (though not necessarily about the child).

The Potential Impact of the COVID-19 Pandemic on Parental Mentalization

Mentalizing plays an essential role in our social lives (Gilead & Ochsner, 2021). In the parenting domain, parental mentalization, often referred to as parental reflective functioning (Slade, 2005) or parental mind-mindedness (Meins, 2013), is considered one of the core components of positive parent-child relationships (Sharp & Fonagy, 2008). Specifically, parental mentalization captures the inner processes enabling sensitive caregiving, attuned to the child's needs (Meins, 2013; Slade, 2005), and is robustly associated with parent-child attachment (Zeegers, Colonnaesi, Stams, & Meins, 2017). Highly-mentalizing parents actively attempt to account for their child's behavior in terms of internal mental states, reflecting on the emotions and cognition motivating their child's observed behavior, and connecting it to their own mental states as parents (Slade, 2005). This ability is also reflected in parents' explicit verbal references to their child's mental states (Meins, 2013). Parental mentalization is conceptualized as playing a role in the development of the child's social cognition and self-regulation abilities, and has been linked with various positive child developmental outcomes (Aldrich, Chen, & Alfieri, 2021), including theory of mind (e.g., Meins et al., 2003) and executive functioning (e.g., Bernier, McMahon, & Perrier, 2017).

Parents' ability to understand their child and model mentalizing during the COVID-19 pandemic

may facilitate family adaptation, and yet, concurrently, the pandemic may also *challenge* parents' ability to mentalize. Challenges to parental mentalization are particularly important to understand given their multi-generational implications. Demanding contexts are thought to dampen mentalizing and lead to higher focus on external behavior rather than the emotions and cognitions motivating actions (Luyten & Fonagy, 2015). However, the impact of demanding caregiving contexts on levels of mentalizing in normative parenting remains unclear. For example, demanding parenting contexts are often confounded with other risk factors for adversity, such as childhood trauma, abuse, or substance use. Although some researchers have measured parental mentalization in stressful laboratory settings (Borelli, Hong, Rasmussen, & Smiley, 2017; McMahon & Newey, 2018), due to ethical considerations, research cannot involve manipulation of prolonged stressful/demanding conditions. The COVID-19 pandemic presents a unique opportunity to examine an ecologically-valid prolonged "manipulation" of caregiving demands on parents' mentalization ability.

Outside the parenting context, mentalization can be considered across four dimensions that may be impacted by the COVID-19 pandemic: (1) Automatic versus controlled mentalization, (2) cognitive versus affective mentalization, (3) mentalization about oneself versus others, and (4) mentalizing based on internal versus external features of experiences (see Luyten & Fonagy, 2015). In this study we focus on the affective-cognitive and self-other dimensions – which generally map onto the automaticity versus control dimensions, respectively, wherein high load (i.e., caregiving demands in this context) and stress are thought to impact primarily controlled aspects of mentalizing in general (Luyten & Fonagy, 2015), and specifically in parenting when thinking about the other (i.e., the child; Yatziv et al., 2018; Yatziv, Kessler, & Atzaba-Poria, 2020).

The affective-cognitive dimension of mentalizing refers to the differentiation between emotional versus rational aspects of mental states (Luyten, Campbell, Allison, & Fonagy, 2020; Tamir, Thornton, Contreras, & Mitchell, 2016). Cognitive mental states include mental capacities, epistemic states, desires, thoughts, and perspective taking (e.g., a parent may infer that their child *finds it hard to concentrate* during online classes), whereas affective mentalizing refers to the emotional features of experiences, such

as joy and distress (e.g., a parent may realize that their child *feels overwhelmed* by remote learning). Engaging in cognitive mentalizing generally requires more control, whereas affective mentalizing may be more salient and partially rely on low-level processes, although effective mentalizing is likely to incorporate both cognitive and affective aspects (Luyten et al., 2020; Schurz et al., 2020; e.g., the child may not be able to concentrate in class because they feel overwhelmed by remote learning). Current measures of parental mentalization do not differentiate between affective or cognitive states and instead aggregate them, and the differential impact of stress on parental mentalization has not been examined separately for cognitive and affective mental states.

The self-other mentalizing dimension refers to a distinction between recognizing and reflecting on one's own thoughts and feelings (e.g., the parent recognizing that *they are worried* about the impact of the pandemic on their child's education), and reasoning on others' mental states (e.g., the parent inferring that *their child feels overwhelmed* by remote learning). While one's own experiences are relatively directly accessible, others' mental states are opaque and thus require indirect reasoning (Fonagy, Target, Steele, & Steele, 1998). Even though self-mentalizing and other-mentalizing may recruit overlapping neural circuitry, mentalizing about one's own mental states is faster and more precise than mentalizing about others (Kevin et al., 2021; Thornton, Weaverdyck, Mildner, & Tamir, 2019), indicating that other-mentalizing may require more control than self-mentalizing (Luyten et al., 2020). In parenting, mentalization has been shown to have parent-focused (self) and child-focused (other) components (e.g., Borelli, St. John, Cho, & Suchman, 2016). However, to our knowledge, the effect of stress on parent-focused and other-focused mentalizing has yet to be examined.

Studying Parental Mentalizing through Social Media

To study changes in parental mentalization following the COVID-19 pandemic, we leveraged the accessibility of social media data. The increased use of social media platforms has sparked interest in research on social media behavior (Ledford, 2020). Specifically, online and social media content can be used to examine the impact of social events on psychological outcomes (Cohn, Mehl, & Pennebaker,

2004). For example, Simchon and colleagues (2020) have investigated the effect of the 2016 US presidential elections on population-level depression among liberal and conservative Americans by analyzing Twitter and Google Search data. Recently, studies have also started examining social media behavior to understand parenting; for example, attitudes towards vaccinations and behaviors such as spanking (Lee et al., 2020; Reich, 2020). In this study, we examine parental mentalization by analyzing parents' posts on "Reddit," a bulletin-board social media platform composed of communities, termed "subreddits," dedicated to specific topics. Parenting subreddits, where communities of parents engage together in pseudonymous online discussions, can inform on parents' experiences. Prior to the pandemic, parenting subreddits have included discussions on a range of topics across multiple domains of parenting, including birth and developmental milestones (e.g., sleep and potty training), food preparation, parenting norms and judgment, discipline, play and activities, product suggestions, religion and the family, and parent/infant health-related issues (Ammari, Schoenebeck, & Romero, 2018). As dynamic parenting communities, parenting subreddits can be used to study the impact of global societal events on parenting, including the COVID-19 pandemic.

Parental mentalization is commonly measured through interviews with parents or recordings of parent-child interactions, with the goal of tapping into parents' mental representations via their discourse on mental states (Meins, 2013; Slade, Bernbach, Grienberger, Levy, & Locker, 2007). The underlying assumption is that the way parents speak about their child's mental states provides a window into how they internally represent their child and their relationship (Meins, 2013; Slade et al., 2007). In representational mind-mindedness assessment, for example, parents are invited to describe their child, and their spontaneous use of terms relating to the child's mind and mental states are tallied to capture the parent's representations of the child as a psychological agent (Meins & Fernyhough, 2015). Both mental-state descriptions and in-depth interviews coding reflective functioning have similar associations with maternal sensitivity and mother-child attachment (Zeegers et al., 2017). Furthermore, parental mind-mindedness when asked to describe the child, parental mind-minded comments during real-time interactions with the child, as well as general use of mental state language (MSL) during parent-child

conversations, have been linked with children's theory of mind development (Devine & Hughes, 2018; Meins et al., 2003; Ruffman, Slade, & Crowe, 2002), speaking to the validity of assessing parental explicit use of MSL in the context of parenting and child outcomes.

To measure mentalizing in a big-data setting, spanning tens of thousands of posts, we examine parental use of MSL on social media. The main difference between previous studies on parental mentalizing or MSL and the present investigation is that we focus on parental communication with other parents. We suggest that through parenting social media, parental representations of mental states can be assessed *ecologically* as manifested in parents' *spontaneous naturalistic* discourse on parenting experiences with other parents. While traditional assessments of mentalizing are focused on a specific relationship (with a particular child), parenting social media discussions would likely refer to parenting more broadly – about one child, several children, partners, or what other parents have shared about their parenting experiences. Previous research indicates that parents' mentalizing is generally consistent across close personal relationships (e.g., Borelli, Slade, Pettit, & Shai, 2020; Illingworth, MacLean, & Wiggs, 2016), and therefore studying parental mentalization through parenting social media may tap into mentalizing in the context of parenting across varying family relationships. Of note, our approach in analyzing MSL through parental social media content as applied to big-data here is more limited than traditional measure of parental mentalization in the ability to take context into account and detect nuances in the plausibility of mental-state attribution.

The Present Study

Due to the heightened caregiving burden during the COVID-19 pandemic, parents may find it harder to focus on others' mental states. This demanding caregiving context may overload parents and elicit excessive focus on external features of behavior at the expense of understating the mental states giving rise to behavior. Therefore, the aim of the present study was to examine whether the COVID-19 pandemic is related to decreased parental mentalizing content posted on parenting social media.

Aims and hypotheses. We hypothesized that during the pandemic, parental posts would contain

less MSL compared to the year prior to the pandemic. Specifically, because demanding and stressful parenting contexts are theorized to primarily impact effortful forms of mentalizing, including cognitive mentalizing (versus affective) and others-focused mentalizing (versus oneself), we expected that during the COVID-19 pandemic, posts would exhibit decreases primarily in cognitive MSL and in use of third-person pronouns, as indicating other-focused content. As exploratory aims, we also examined (1) the impact of different time-periods during the pandemic, (2) parent gender differences, and (3) changes in the specific mental states parents referred to.

Time-periods of interest during the COVID-19 pandemic. We initially planned to compare content posted between March 1st-April 30th, 2020 (COVID-19) and the same time-period in 2019 as a time-matched control period. March-April 2020 marked the beginning of the pandemic and lockdown period: Forty US states, and the UK and Canadian governments, imposed COVID-19 related lockdowns, restrictions, or stay-at-home orders during March or by April 1st, 2020, and the UK and most US states started easing restrictions during May 2020 (Ballotpedia.org, 2020). Although the nature of the restrictions families faced varied between different locations during the time-period between March and April 2020, given the large-scale implementation of stay-at-home orders across the US, the UK, and Canada, we refer to this initial phase of the pandemic hereafter as the “lockdown” period for simplicity and brevity. As the pandemic continued and public discussions of prolonged parenting burden emerged (e.g., Bariola & Collins, 2021), we decided to also analyze content posted between July 1st-August 31st, 2020 (hereafter, “post-lockdown”) and compare it to the same time-period in 2019. At this time, most US states had enabled school reopening (Ballotpedia.org, 2021b; The Hunt Institute, 2021); nevertheless, most children were either still learning remotely or dividing their time between remote and in-person learning (Kapteyn et al., 2020).

Mothers and fathers during the pandemic. We examined the role of parental gender as a potential moderator of the effect of the COVID-19 pandemic on parental MSL by sampling posts from general parenting, mothers-specific, and fathers-specific subreddits (given the pseudo-anonymity of Reddit users, gender was operationalized through the subreddits parents posted in). As groups, both mothers and fathers

experienced increased distress during the pandemic, initially stress estimates generally appeared larger among mothers than fathers (Dunatchik, Gerson, Glass, Jacobs, & Stritzel, 2021; Wade et al., 2021; Zamarro & Prados, 2021) but some have found greater parenting stress among fathers (Taubman-Ben-Ari, Ben-Yaakov, & Chasson, 2021). While the uniform shift to working from home was initially discussed as a potential “equalizer” in gender-roles, over time the pandemic seems to have amplified existing gender disparities (Carlson, Petts, & Pepin, 2020; Fisher & Ryan, 2021), and mothers continued to carry most of the caregiving, homeschooling, and household maintenance (Bariola & Collins, 2021; Dunatchik et al., 2021; Wade et al., 2021; Zamarro & Prados, 2021). Consequently, while we expected the COVID-19 pandemic to impact both maternal and paternal mentalization during lockdown, we anticipated that the accumulation of caregiving burden, particularly among mothers as the pandemic progressed, would evidence a stronger decrease in mentalizing in mothers-specific than fathers-specific subreddits post-lockdown.

Method

Sample

Data were posts collected from Reddit, one of the 20 most visited websites in the world (Alexa.com, 2021b). Reddit (2020) had 430 million users worldwide in 2019, with 40-50% of traffic originating from the US, followed by the UK (~8%) and Canada (~7-8%; Alexa.com, 2021a; Statista.com, 2021). American Reddit users are primarily White, male, under the age of 49, and have at least some college education (Pew Research Center, 2016). Because Reddit data is publicly available, Yale University’s Institutional Review Board exempted this study from annual ethics review.

We searched for English-language subreddits whose primary audience were parents (mothers, fathers, and parents in general). The search was conducted mainly during July 2020 via Reddit’s search bar and by following relevant suggestions made by the platform. Subreddit communities that were primarily about pregnancy or breastfeeding, specific to sharing activities with children, centered around making fun of children or parents, or inactive in 2020, were excluded. Twenty-three subreddits met our

inclusion criteria (Table S1, Supplemental Online Materials; SOM): Sixteen general parenting subreddits (e.g., “r/Parenting;” hereafter, “general”), three mother-specific subreddits (e.g., “r/Mommit”), and four father-specific subreddits (e.g., “r/daddit”). At the time of search, most communities had a few thousand members, and “r/Parenting” had the largest community of 2.4 million members.

Posts were sampled during the initial phase of the pandemic characterized by large implementation of lockdowns and stay-at-home orders (March-April) and post-lockdown (July-August) periods during the COVID-19 pandemic in 2020, and in the equivalent times in 2019 as control periods, indexing time-matched pre-pandemic parental discourse. Reddit posts were sampled using the R package “rreddit” (Kearney, 2018), which is based on the Pushshift API (Baumgartner, Zannettou, Keegan, Squire, & Blackburn, 2020). 93,510 posts were initially identified; raw data were cleaned to remove URL addresses, emoticons, symbols, and invalid utf8 content, resulting in a final sample of 77,254 posts. Posts were lemmatized and transformed to lowercase for analyses.

Measures

MSL. We measured parents’ use of MSL using two measures: (1) frequency of mental-state terms based on a new MSL dictionary created for this study, and (2) the Mental-Physical Verb Norms measure (Orr & Gilead, 2021). As described below, these measures were created by employing two different measure-development approaches resulting in different outcome variables, and ultimately data analytic approaches, providing the opportunity to assess both the robustness and convergent validity of our findings in this first examination of parental mentalizing on social media posts.

Mental-state terms. A dictionary containing 198 cognitive (e.g., “curious,” “prefer”) and 135 affective (e.g., “happy,” “upset”) mental-state terms was created based on multidisciplinary mentalizing research (SOM). Mental-state terms were collected from: (1) the mind-mindedness coding manual (Meins & Fernyhough, 2015); (2) the “desire,” “emotion,” “think and know,” and “other mental state” categories from the MSL measure described in Ruffman et al. (2002); (3) the full list of mental-state terms reported in Tamir et al. (2016), and (4) the CogProc and Affect categories from the Linguistic Inquiry and Word

Count (LIWC2015; Pennebaker, Boyd, Jordan, & Blackburn, 2015). In keeping with conceptualizations of parental mentalization, primarily the mind-mindedness manual (Meins & Fernyhough, 2015), only words referring to aspects of internal experiences were included; terms that referred to physical states (e.g., “thirst”) or to behavioral manifestations of mental states (e.g., “crying”) were excluded (for full documentation see: <https://osf.io/psbm7/>). Two-words phrases were excluded from the list for computational reasons. Affective MSL, cognitive MSL, and total MSL (cognitive and affective MSL) were measured by summing the number of MSL terms in each post by category, based on document feature matrices created using the “quanteda” R package (Benoit et al., 2018).

Mental-physical verb norms. We applied the “Mental-Physical Verb Norms” scale devised by Orr and Gilead (2021). The scale contains the 250 most frequently used verbs in the English language (about 80% of all verbs used in typical corpora), each rated by English speakers on a scale between “0” (strictly physical activity) and “100” (strictly mental activity). Mean ratings across participants represent the norm value of the extent to which English speakers perceive each verb as mental on a continuous scale, with higher scores representing the perception of the verb as more mental than physical. For example, the verb “run” received a mean rating of 7.17 indicating it was largely perceived as a physical activity. In contrast, the verb “understand” received a mean rating of 93.78, indicating that it was largely perceived as a mental activity. The frequency of each verb in each post was weighted by its corresponding norm rating and mean mental-physical scores were computed for each post by summing the weighted norms and scaling the sum by the number of verbs in the post.

Thirty-six of the verbs (14.4%) overlapped with terms included in the MSL dictionary ($M_{norm}=82.44$, $SD=10.59$, $min-max=54.63-93.78$); most overlapping words appeared in the cognitive MSL dictionary (as would be expected given the focus on actions), and only four verbs appeared in the affective MSL dictionary. The Spearman-rank correlations between the mental-physical and cognitive and affective MSL scores (correlation with MSL proportion out of the total word count in parentheses) were $r = .33 (.59)$, and $r = .12 (.16)$, respectively.

Pronouns: References to oneself and to others. As a proxy for self- and other-focused

mentalizing, we measured parents' use of pronouns, using two types of analyses: (1) counting the number of first- and third-person pronouns in posts, and (2) computing the proportion of third-person (other-focused) mental attributions. In this context, first- and third-person pronouns can reflect whether parents engaged in thinking about themselves or about non-present others.

Number of pronouns. To measure self-focused and other-focused mentalizing, we assessed the number of singular first-person pronouns (e.g., “I,” “me”) and the number of third-person pronouns (e.g., “they,” “she”), respectively, derived from the LIWC2015 (Pennebaker et al., 2015).

Proportion of other-focused mental attributions. To better understand whether mental states were ascribed to non-present others, we employed sentence parsing: a syntactic analysis of sentences, resulting in the full syntactic properties of the sentence's elements, including the tagging of part-of-speech, morphological features, and dependency relation. We used the ‘udpipe’ R package (Wijffels, 2020) powered by the UDPipe parser (Straka & Straková, 2017) and its English model (English-ewt version 2.5-191206).

Posts were sliced into sentences using the ‘tidytext’ R package (Silge & Robinson, 2016). All sentences that *included MSL* were then parsed to (1) tag sentences for which a pronoun was used as their subject (nominal subject), and (2) mark their grammatical person, that is, whether the subject pronoun was first-, second-, or third-person. For sentences with pronouns as nominal subjects, we calculated the proportion of each grammatical person appearing in a subject position (in some cases, there may be more than one nominal subject, e.g., compound sentences).

Other-focused mental attributions were measured as the proportion of sentences containing MSL with a third-person pronoun as the subject. We focused on third-person pronouns due to the dependency in assignment to pronoun categories, and our specific interest in the impact of stress and caregiving demand on other-focused mentalizing. For example, the sentences “she... came to her conclusion all by herself” and “he hates me and my fiancé” each received a score of “1”, whereas the sentences “I just feel so powerless...” and “as a parent, I am concerned” each received a score of “0”. Sentences in which several pronouns were detected as dominantly “third-person” if the proportion of third-person pronouns

was larger than the first-person proportion. Sentences that did not have a nominal subject were coded as “0,” as were posts that did not contain any MSL, as both were taken to convey a lack of other-focused mentalizing.

Analytic Plan

For the code and analyses, see OSF repository: <https://osf.io/psbm7/>.

Main analyses. A series of general linear models (GLMs) were conducted, with MSL measures as dependent measures and year (2019 vs. 2020), time-period (lockdown/ March-April, post-lockdown/July-August), and subreddit gender (general, mothers, fathers) as independent variables (all effect-coded). Post-hoc pairwise comparisons were conducted when main effects or interactions were significant. For count dependent variables (total/ affective/ cognitive MSL, first-person/ third-person pronouns), we examined whether data met Poisson GLM’s assumptions. Fitting indicated significant overdispersion in all models ($p_s < .001$), and therefore negative binomial models were fitted to count data using the “MASS” R package (Ripley et al., 2021). Total word count was entered as a covariate (mean-centered) to control for posts’ length. Analyses of deviance of the negative binomial models were conducted to examine main effects and interactions over-and-above simple effects, and simple effects are reported as incident-rate-ratios (IRRs). To examine the impact of the COVID-19 pandemic on MSL as measured by mental-physical scores, we conducted an analysis of variance (ANOVA). To test the impact of the COVID-19 pandemic on the proportion of other-focused mental attributions, we conducted an analysis of deviance of a quasi-binomial GLM. Because the mental-physical and the other-focused mentalizing attributions scores were already scaled for number of verbs or sentences, we did not control for word count in these analyses.

Exploratory “keyness” analyses of MSL terms. To examine whether a qualitative change in the specific mental states parents referred to occurred during the pandemic, we conducted exploratory “keyness” analyses examining the relative frequency of each word in the full MSL dictionary between 2019 (control period) and 2020 (COVID-19 pandemic), separately for each time-period (lockdown, post-

lockdown). To account for multiple comparisons, only Chi-square values that remained significant following Bonferroni correction ($p < .00015$) were considered to reflect statistically significant differences in frequency.

Results

Descriptive Analyses of Parental Posts

We first sought to characterize the sampled content. The number of posts by year, time-period, and subreddit gender, and the corresponding means and standard deviations of the number of words per post, are presented in Table 1. Parents posted more content during 2020 ($N=42,024$) than 2019 ($N=35,229$). Content posted during the pandemic was shorter than content posted during 2019, $\chi^2(1) = 46.07$, $p < .001$, and posts posted during March-April were shorter than posts posted during July-August (across both years), $\chi^2(1) = 50.10$, $p < .001$. Furthermore, word count varied by subreddit gender, $\chi^2(2) = 873.05$, $p < .001$, with maternal posts containing more words than posts from general subreddits, and fathers posting the shortest posts on average ($|z|_s > 11.40$, $p_s < .001$).

Table 1

Ns, Means, and Standard Deviations of Posts' Length (in words) by Year, Time-Period, and Subreddit Parental Gender

Time-Period	Year	General		Mothers		Fathers	
		<i>N</i>	<i>M (SD)</i>	<i>N</i>	<i>M (SD)</i>	<i>N</i>	<i>M (SD)</i>
March-April	2019	12,457	238.72 (263.53)	3,581	258.11 (252.49)	734	162.95 (180.56)
	2020	16,084	222.94 (246.97)	3,816	247.12 (250.08)	857	139.91 (238.25)
July-August	2019	13,853	241.61 (258.14)	3,763	271.50 (253.82)	841	162.79 (190.67)
	2020	16,510	239.89 (270.87)	3,857	256.65 (238.00)	900	148.96 (177.53)

Word clouds depicting commonly used terms are shown in Figure S1 (SOM). As would be expected, during 2020 parents' posts dealt with pandemic-related issues, including virus-related words ("COVID," "virus") and pandemic-related experiences ("masks," "quarantine," "distance," "online"). Furthermore, family terms during the pandemic were more related to parents ("dad," "mom," "parent") whereas in 2019 they were generally more related to children ("son," "daughter").

Content also varied between lockdown and post-lockdown periods of 2020 (Table S2 and Figure S1, SOM). During lockdown, parents referred more to "stress," "panic," and "crisis," and post-lockdown they mentioned the words "trauma" and "horrible" more. Parents also discussed school-related terms more during lockdown ("teacher," "school," "homework"). Although the word "online" was more frequent during lockdown, post-lockdown parents mentioned the terms "remote" and "virtual" more frequently, perhaps relating to remote learning. Parents also referred to "normal" activities ("vacation," "beach," "camp") during the post-lockdown (summer) period.

Main Analyses: Parental Mentalization During the COVID-19 Pandemic

MSL. The median total MSL was 6 mental state words per post ($M=8.83$, $SD=10.22$). Parents used more cognitive ($Md=4$, $M=6.24$, $SD=7.28$) than affective ($Md=1$, $M=2.59$, $SD=3.67$) MSL, $t(77,253) = 189.86$, $p < .001$. Posts that contained more cognitive MSL also tended to contain more affective MSL (*Spearman's* $r = .61$, $p < .001$). Table 2 presents the results of the analysis of deviance of the negative binomial models examining the effects of year, time-period, and subreddit gender on MSL. Mean affective and cognitive MSL by levels of independent variables, controlling for word count, are presented in Figure 1.

Total MSL. Results revealed main effects for year, time-period, and subreddit gender, qualified by Year x Time-Period and Year x Subreddit Gender interactions.

To probe the year by time-period interaction, we compared the simple effect of year (2020, 2019) in each time-period. MSL was lower during COVID-19 lockdown compared to March-April 2019, $z = 3.25$, $p = .001$ (2020-to-2019 ratio = 0.96 (0.013), 95% CI[0.93, 0.98]). The difference between July-

August 2019 and 2020 was nonsignificant, $z = -0.40$, $p = .691$ (*2020-to-2019 ratio* = 1.005 (0.013), CI[0.98, 1.03]). That is, MSL decreased only during the lockdown period.

We next probed the Year x Subreddit Gender interaction. In general subreddits (mothers and fathers), the IRR between 2020 and 2019 was .99 (0.0055; CI[0.98, 1.00]), and did not reach statistical significance, $z = 1.94$, $p = .053$; however, it should be noted that (as suggested by the Year x Time-Period interaction) the effect of the COVID-19 pandemic in general parenting subreddits was significant when considering only the lockdown period ($z = 2.25$, $p = .024$, *2020-to-2019 ratio* = 0.98 (0.008), CI[0.97, 0.998]). MSL decreased significantly during the pandemic among fathers, $z = 2.49$, $p = .013$ (*2020-to-2019 ratio* = 0.94 (0.024), CI[0.89, 0.99]). However, the pandemic did not have a significant effect on MSL in maternal subreddits, $z = -1.42$, $p = .156$ (*2020-to-2019 ratio* = 1.015 (0.011), CI[0.99, 1.04]).

Affective MSL. Results indicated a main effect of subreddit gender and time-period, qualified by a Year x Time-period interaction.

We first probed the effect of the COVID-19 pandemic by time-period. Affective MSL was lower during lockdown compared to March-April 2019, $z = 2.07$, $p = .039$ (*2020-to-2019 ratio* = 0.96 (0.020); CI[0.92, 0.998]). The difference between July-August 2019 and 2020 (post-lockdown) was nonsignificant and in the opposite direction, $z = -1.40$, $p = .162$ (*2020-to-2019 ratio* = 1.03 (0.021), CI[0.99, 1.07]).

As to gender differences in affective MSL, maternal subreddits had significantly more affective MSL terms compared to both general parenting subreddits, $z = 13.64$, $p < .001$ (*mothers-to-general ratio* = 1.14 (0.011), CI[1.11, 1.16]), and paternal subreddits, $z = 10.67$, $p < .001$ (*mothers-to-fathers ratio* = 1.26 (0.027), CI[1.20, 1.325]). General subreddits contained more affective MSL than paternal subreddits, $z = 5.05$, $p < .001$ (*general-to-fathers ratio* = 1.10 (0.023), CI[1.06, 1.16]).

Cognitive MSL. Results indicated significant main effects for all variables, qualified by Year x Time-Period and Year x Subreddit Gender interactions, indicating that the effects observed for total MSL were mainly driven by cognitive MSL.

We first examined the simple effect of year by time-periods. Cognitive MSL was significantly lower in March-April 2020 compared to March-April 2019, $z = 3.07$, $p = .002$ (*2020-to-2019 ratio* = 0.96

(0.014), CI[0.93, 0.98]). The difference between July-August 2019 and 2020 was nonsignificant, $z = 0.27$, $p = .788$ (2020-to-2019 ratio = 0.996 (0.0135), CI[0.97, 1.02]), indicating that cognitive MSL decreased only during lockdown.

We next probed the Year x Subreddit Gender interaction. Cognitive MSL significantly decreased during the pandemic on general parenting subreddits, $z = 2.42$, $p = .016$ (2020-to-2019 ratio = 0.99 (0.006), CI[0.975, 0.997]) and paternal subreddits, $z = 2.54$, $p = .011$ (2020-to-2019 ratio = 0.93 (0.025), CI[0.89, 0.985]), but not on maternal subreddits, $z = -0.94$, $p = .348$ (2020-to-2019 ratio = 1.01 (0.011), CI[.99, 1.03]).

Mental-physical scores. Parents' mean mental-physical score was 42.97 ($SD=11.55$), indicating that, on average, parents tended to use verbs that reflected more physical than mental activity. ANOVA results predicting mental-physical scores are reported in Table 2 and mean scores by year, time-period and gender are presented in Figure 1 (lower panel). Results indicated main effects for year and subreddit gender, qualified by a Year x Subreddit Gender interaction. Pairwise comparisons indicated that mental-physical scores were significantly lower during the COVID-19 pandemic compared to 2019 at all subreddit gender levels, but the differences between the years varied in effect sizes. The effect was strongest in paternal subreddits, *mean difference* = -2.52, $t(77,241) = -6.29$, $p < .001$, *Cohen's d* = 0.05, followed by general parenting, *mean difference* = -0.53, $t(77,241) = -5.52$, $p < .001$, *Cohen's d* = 0.04, and maternal, *mean difference* = -0.54, $t(77,241) = -2.89$, $p = .004$, *Cohen's d* = 0.02, subreddits.

Table 2

Analyses of Deviance or Variance for Testing Year, Subreddit Gender, and Time-Period in Predicting Measures of MSL

Effect	Total MSL			Affective MSL		Cognitive MSL		Mental-Physical Scale			
	χ^2	DF	p-value	χ^2	p-value	χ^2	p-value	F	DF	p-value	η_p^2
<i>Main effects</i>											
Year	4.44	1	.035	0.30	.585	5.95	.015	62.96	1, 77241	< .001	.0008
Subreddit Gender	180.27	2	< .001	231.00	< .001	175.56	< .001	195.31	2, 77241	< .001	.005
Time-Period	10.42	1	.001	5.70	.017	8.38	.004	<1	1, 77241	.405	.000009
<i>Two-way Interactions</i>											
Year x Subreddit Gender	9.81	2	.007	4.33	.115	8.63	.013	11.79	2, 77241	< .001	.0003
Year x Time-Period	7.08	1	.008	6.24	.013	4.27	.039	<1	1, 77241	.695	.00001
Subreddit Gender x Time-Period	1.34	2	.512	0.51	.774	2.01	.366	<1	2, 77241	.689	.00001
<i>Three-way Interaction</i>											
Year x Subreddit Gender x Time-Period	3.10	2	.212	0.82	.665	3.77	.152	<1	2, 77241	.566	.000015

Note. MSL negative binomial models included word count as a covariate (not reported in the table). For the mental-physical scale ANOVA, MSE = 132.55 for all effects. MSL = mental state language. DF = degrees of freedom.

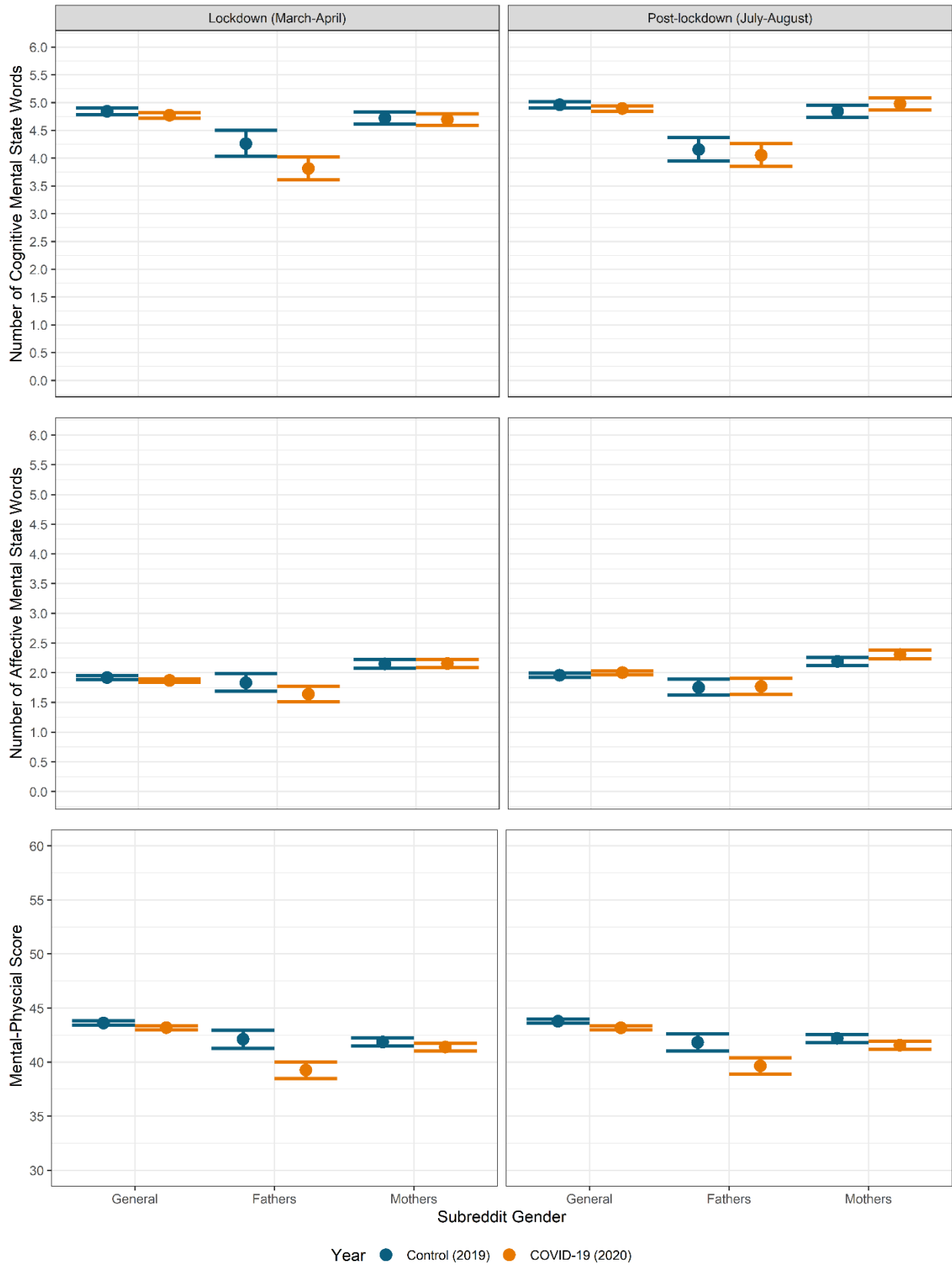


Figure 1. Mean number of cognitive (upper panel) and affective (middle panel) mental state words and

mean mental-physical scores (lower panel) as a function of year (COVID-19 pandemic in orange, 2019 as the control period in turquoise), subreddits' primary gender (general, fathers, or mothers), and time-period (lockdown during March-April, left, and post-lockdown during July-August, right). The upper and middle panels are presented after controlling for posts' word count (centered). Error bars represent 95% CI.

Pronouns. Parents used more first-person ($Md=9$, $M=14.63$, $SD=18.7$) than third-person ($Md=6$, $M=11.04$, $SD=15.56$) pronouns, $t(77,253) = 68.48$, $p < .001$. Table 3 presents the effect of the pandemic on first-person and third-person pronouns usage, respectively, and the proportion of other-focused mental attributions. Means by levels of independent variables are presented in Figure 2.

First-person pronouns: self-mentalizing. Results indicated significant main effects of gender and time-period, and a Year x Time-Period interaction.

We first probed the year by time-period interaction. Use of first-person pronouns was significantly lower in March-April 2020 compared to March-April 2019, $z = 2.63$, $p = .008$ (*2020-to-2019 ratio* = 0.96 (.014), CI[0.93, 0.99]). However, the difference between July-August 2019 and 2020 was nonsignificant and in the opposite direction, $z = -1.37$, $p = .171$ (*2020-to-2019 ratio* = 1.02 (.014), CI[0.99, 1.05]). That is, self-references decreased only during lockdown.

Posts on maternal subreddits contained more first-person pronouns than posts on general subreddits, $z = 30.21$, $p < .001$ (*mothers-to-general ratio* = 1.23 (.008), CI[1.21, 1.25]), and posts on paternal subreddits, $z = 26.95$, $p < .001$ (*mothers-to-fathers ratio* = 1.50 (.02), CI[1.45, 1.56]). General subreddits contained more first-person pronouns than paternal subreddits, $z = 14.20$, $p < .001$ (*general-to-fathers ratio* = 1.23 (.02), CI[1.18, 1.26]).

Third-person pronouns: other-mentalizing. Results indicated significant main effects for year and subreddit gender in predicting the number of third-person pronouns. Parental posts during the COVID-19 pandemic contained significantly less references to non-present others compared to 2019 (*2020-to-2019 ratio* = 0.96 (.012), CI[0.93, 0.98]). Posts on general subreddits contained more third-person pronouns than posts on maternal subreddits, $z = 18.93$, $p < .001$ (*general-to-mothers ratio* = 1.18 (.01), CI[1.15, 1.20]), and posts on paternal subreddits, $z = 21.01$, $p < .001$ (*general-to-fathers ratio* = 1.455 (.03),

CI[1.39, 1.52]). Paternal subreddits contained less third-person pronouns than maternal subreddits, $z = -11.12$, $p < .001$ (*fathers-to-mothers ratio* = 0.81 (.015), CI[0.77, 0.85]).

We next examined *the proportion of other-focused mental attributions* ($M = .20$, $SD = .25$). The quasi-binomial model revealed a similar pattern, indicating main effects for year and subreddit gender. The proportion of other-focused mental attributions was significantly lower during the pandemic compared to 2019 (*2020-to-2019 odds-ratio* (OR) = 0.91 (0.02), CI[0.87, 0.95]). General subreddits had significantly higher proportion of other-focused mental attributions compared to paternal, $z = 10.11$, $p < .001$ ($OR = 1.36$ (0.041), CI[1.27, 1.46]) and maternal, $z = 12.83$, $p < .001$ ($OR = 1.21$ (0.018), CI[1.17, 1.25]) subreddits. Paternal subreddits had a lower proportion of other-focused mental attributions than maternal subreddits, $z = -3.56$, $p = .001$ ($OR = 0.89$ (0.03), CI[0.82, 0.96]).

Table 3

Analyses of Deviance for Testing Year, Subreddit Gender, and Time-Period in Predicting Pronoun Measures

Effect	First-Person Pronouns			Third-Person Pronouns		Other-focused Mental Attributions	
	χ^2	DF	<i>p-value</i>	χ^2	<i>p-value</i>	χ^2	<i>p-value</i>
<i>Main effects</i>							
Year	0.94	1	.332	12.55	< .001	17.74	< .001
Subreddit Gender	1245.76	2	< .001	721.22	< .001	252.81	< .001
Time-Period	6.92	1	.0085	3.00	.083	0.47	.493
<i>Two-way Interactions</i>							
Year x Subreddit Gender	1.88	2	.391	3.30	.192	5.21	.074
Year x Time-Period	8.32	1	.004	0.56	.454	2.26	.133
Subreddit Gender x Time-Period	0.84	2	.658	1.47	.481	1.68	.431
<i>Three-way Interaction</i>							
Year x Subreddit Gender x Time-Period	2.78	2	.2495	1.35	.509	3.50	.173

Note. The first- and third-person pronouns negative binomial models included word count as a covariate (not reported in the table). DF = degrees of freedom.

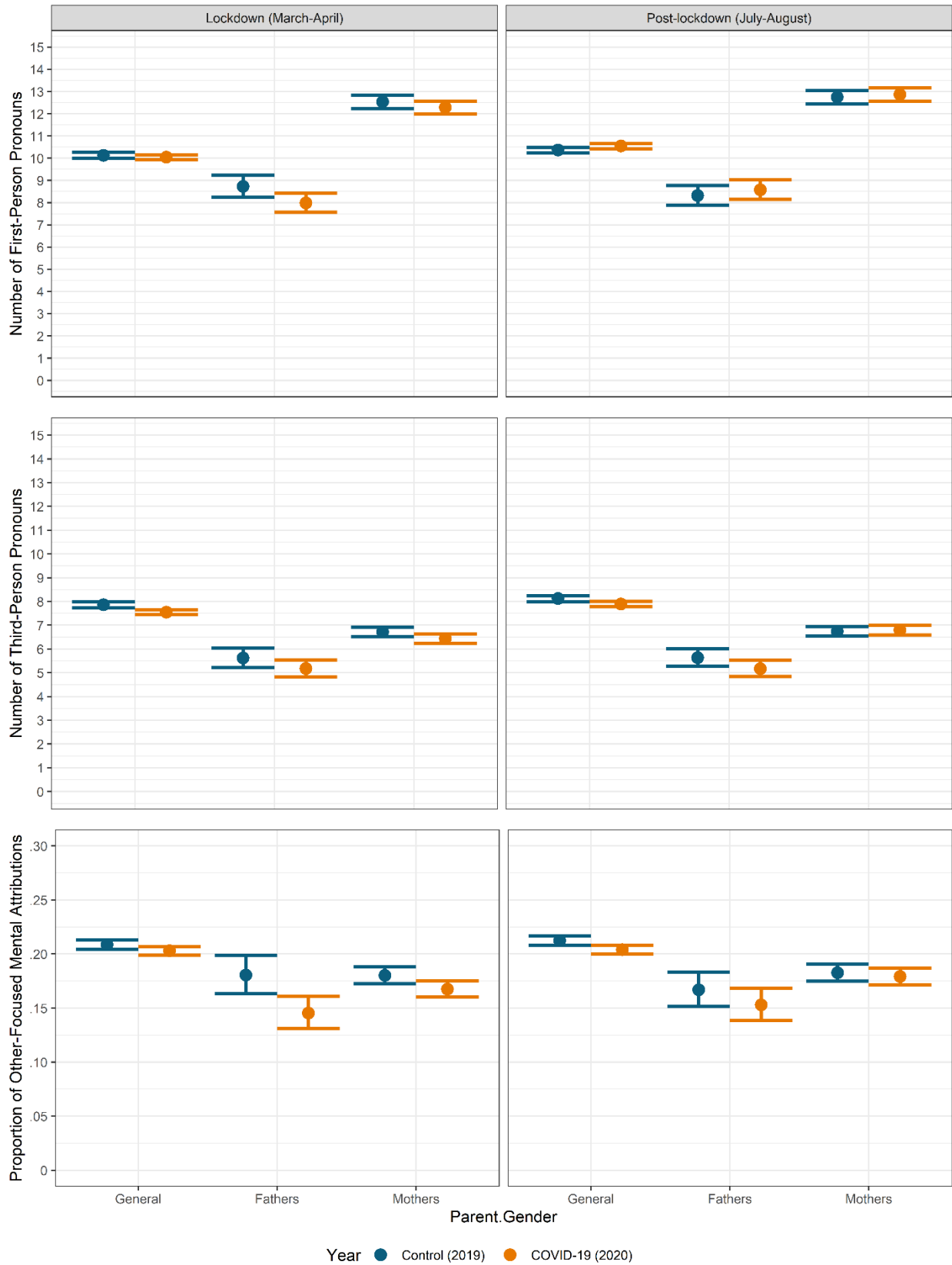


Figure 2. Mean number of first-person (upper panel) and third-person (middle panel) pronouns, and mean

proportion of other-focused mental attributions (lower panel) as a function of year (control period 2019 versus COVID-19 pandemic in 2020), subreddits' primary gender (general, fathers, or mothers), and time-period (lockdown during March-April and post-lockdown during July-August). The upper and middle panels are presented after controlling for posts' word count (centered). Error bars represent 95% CI.

Relative-Frequency “Keyness” Analyses

A relative-frequency “keyness” analyses was conducted to explore whether the use of individual mental-state terms in the MSL dictionary varied as a function of the COVID-19 pandemic. Considering the MSL differences between the lockdown and post-lockdown periods reported above, we examined changes in word frequency separately for each time-period, and then compared between the two periods during the pandemic.

Lockdown: March-April 2019 versus 2020. Significant changes in mental-state terms between March-April 2019 and 2020 and their Chi-square values are presented in Figure 3. During lockdown, parents referred more to words related to stressful experiences (“stress,” “uncertain,” “craziness”), and to mental states that likely related to caregiving challenges (“respect,” “boredom,” “creative”). Words indicating positive experiences (“happy,” “relax,” “amaze”), were more frequent in 2019. However, some words that appeared more during 2019 also had negative valence, possibly relating to experiences that may be more likely to arise in social situations (“nervous,” “resent,” “shy”).

Post-lockdown: July-August 2019 versus 2020. Consistent with the general similarity in MSL between the two periods, only two mental-state terms differed in their frequency between July-August 2019 and 2020: “feel” was used more during the post-lockdown period of 2020, $\chi^2(1) = 15.87, p < .001$, whereas “fun” was used more in 2019, $\chi^2(1) = 18.26, p < .001$.

Lockdown versus post-lockdown during the pandemic. Post-lockdown, parents referred more to the words “feel,” “emotion,” and “enjoy,” than during lockdown (Figure 3). Mirroring the difference between March-April 2019 and 2020, during lockdown parents used more words related to stress and to caregiving challenges than post-lockdown (although “fun” was more frequent during lockdown).

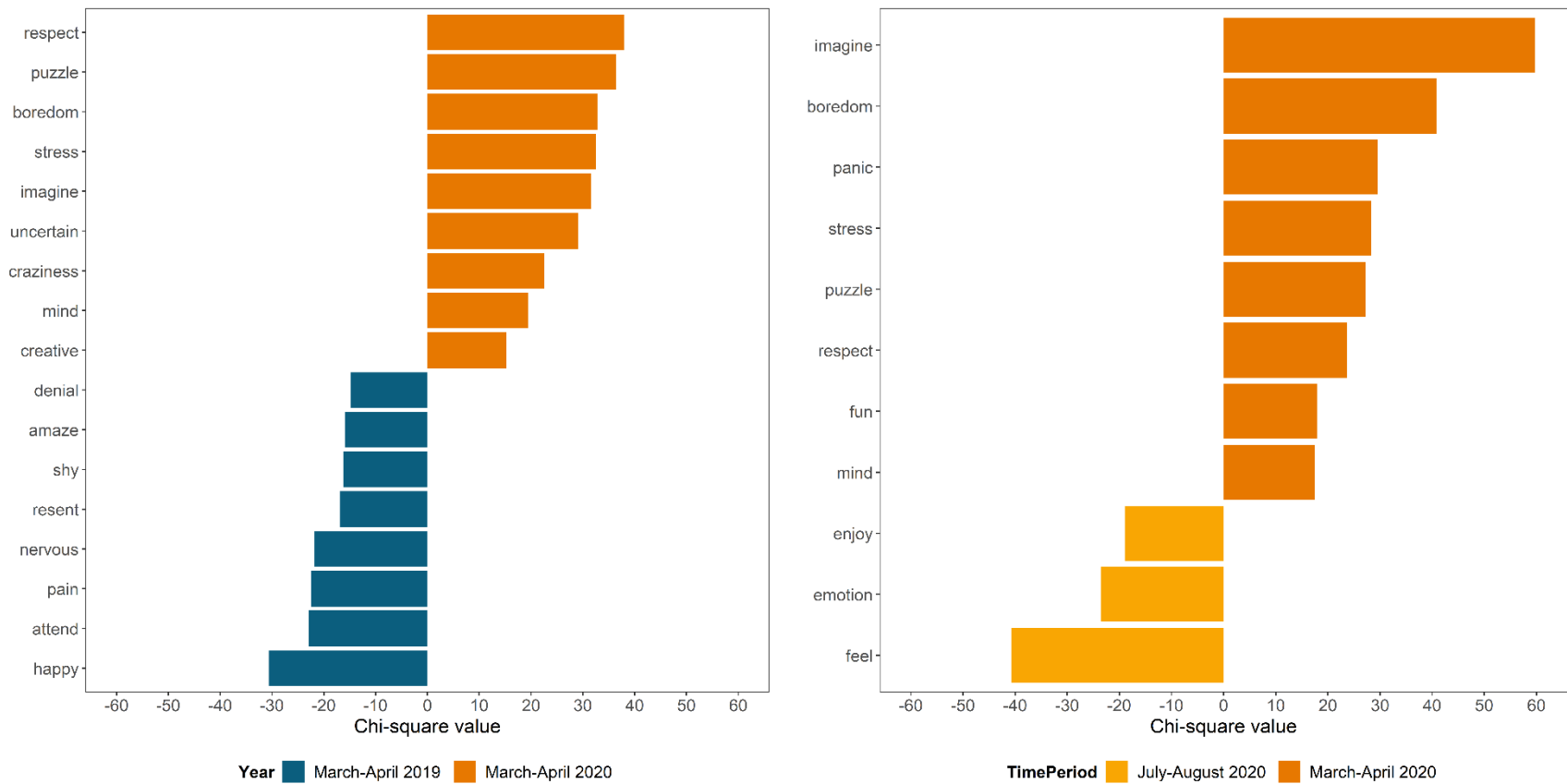


Figure 3. Results of the relative frequency (“keyness”) analysis, examining the differences in the use of mental state words from the MSL dictionary collapsed across gender. The left panel presents a comparison between the lockdown period (March-April 2020) and the time-matched control period (March-April 2020), collapsed across genders; the x-axis represents the value of the Chi-square for independence test, with positive values indicating higher frequency during COVID-19 pandemic lockdown (March-April 2020) and negative values indicating higher frequency during the control period (March-April 2019). The right presents a comparison between the lockdown period (March-April 2020) and the post-lockdown period (July-August 2020); positive values indicate higher frequency during lockdown and negative values indicating higher frequency post-lockdown. Only words that had significant Chi-square values after correcting for multiple comparisons are presented.

Discussion

The aim of the present study was to examine whether the COVID-19 pandemic, as a demanding caregiving context, was related to changes in parental mentalization, by characterizing the use of mental state language (MSL) in parenting social media content before and during the pandemic. Specifically, we examined parental MSL and use of first-person and third-person pronouns in approximately 77,000 posts from parenting-related Reddit communities. During the initial phase of lockdown or stay-at-home restrictions (March-April; “lockdown”) and post-lockdown (July-August) periods of 2020, parents used verbs reflecting more physical than mental activities and referred less to non-present others in their posts compared to the corresponding periods in the prior year, 2019. During lockdown, parents used less cognitive MSL, affective MSL, and self-references. Results also revealed gender differences in baseline levels of MSL, as well as in pandemic-related changes in MSL. Although most effects were evident in general parenting subreddits, including both mothers and fathers, the strongest effects were found in fathers-specific subreddits. In maternal subreddits, only the use of pronouns and the physical-mental scores decreased during the COVID-19 pandemic. Contrary to our hypothesis, maternal mentalization content was not lower during the post-lockdown period as compared to 2019. Taken together, these findings relating to mentalizing content on social media suggest changes in parental mentalization during the COVID-19 pandemic, especially among fathers, which may potentially have significant implications for caregiver behavior beyond social media platforms into the family setting.

Demanding Caregiving Contexts and Dimensions of Parental Mentalization

The COVID-19 pandemic can be contextualized as a demanding time for parents characterized by caregiving burden, acting as a natural “manipulation” of caregiving contexts in (normative) parenting. Two time-periods that may represent different types of pandemic-related caregiving changes and challenges were examined: (1) the beginning of the pandemic and lockdown period (March-April 2020), when many around the world, including parents, experienced the highest levels of emotional distress (e.g., APA, 2020; Markovic, Mühlematter, Beaugrand, Camos, & Kurth, 2021); and (2) post-lockdown (July-

August 2020), after accumulation of caregiving burden and a period during which schools began reopening, mostly remotely, and families were facing another transition. Our results reveal that although some measures of mentalizing content were lower during both time-periods (relative to the equivalent periods in 2019), the frequency of MSL decreased mainly during lockdown.

Our findings suggest that the initial phase of the pandemic and lockdown period (which we term “lockdown” for simplicity) was a qualitatively different experience for parents compared to both the post-lockdown period included in our analysis (Summer of 2020) and the control periods in 2019. The largest decrease in MSL was evident during the lockdown period, and when parents did mention mental states, they tended to convey an experience of stress, struggling with uncertainty and child-rearing difficulties. In contrast, mental states that were more frequently mentioned during the parallel period in 2019 conveyed a more well-rounded and complex experience, with a mixture of positive and negative experiences, perhaps reflecting more sophisticated mentalizing (e.g., “denial”) and more socially-driven mental states experienced less under social isolation (“shyness,” “resentment”). Parents’ posts were generally shorter during the pandemic compared to 2019, possibly reflecting a similar decrease in complexity, although other reasons may impact this finding as well (e.g., limited time to post) and this should be further explored.

July-August 2019 and 2020 did not differ as much in the frequency of mental-state terms. A similar pattern also emerged in the descriptive content analyses: While lockdown posts were characterized by acute stress reactions and managing school closures or work adjustments, the post-lockdown period appeared to be a mixed experience, characterized by a combination of normal summer activities on the one hand and trauma on the other. Interestingly, one of the stressors that parents have reported experiencing before the pandemic was guilt over not spending enough time with their families (Nomaguchi & Milkie, 2020); across the pandemic, research has indicated independent increases in both parenting demands and satisfaction from family life (Rudolph & Zacher, 2021), and uninterrupted childcare was related to perception of increased family time as a positive aspect of the pandemic (Calarco, Anderson, Meanwell, & Knopf, 2020). Therefore, there may be heterogeneity in how stressful the

summer of 2020 was for parents, perhaps depending on when and how schools reopened, child age, and/or socioeconomic status.

The decrease in parental mentalization during the COVID-19 pandemic, especially during the lockdown period, may be driven by the increased parenting demands and stressful caregiving context elicited by the pandemic. Although stress and demands were not directly measured or manipulated, our content analyses support the saliency of challenging, demanding, and stressful experiences in parents' posts, particularly under lockdown. Previous research on the links between emotional distress and parental mentalization has been largely inconsistent (e.g., Cordes et al., 2017; Luyten, Mayes, Nijssens, & Fonagy, 2017; McMahon & Meins, 2012; Yatziv, Gueron-Sela, Meiri, Marks, & Atzaba-Poria, 2020). Differently from past studies, which focused on trait-level individual differences, in this study we examined group differences in state-level mentalizing across two dimensions— affective-cognitive and self-other mentalizing— following a global event that impacted family lives.

Our findings are only partially in line with predictions derived from the hypothesis that stress and load primarily dampen cognitive (vs. affective) and other- (vs. self-) focused mentalizing (Luyten et al., 2020; Luyten & Fonagy, 2015). Cognitive MSL was lower during lockdown compared to March-April 2019 in general and paternal subreddits, and mental-physical scores were lower during both lockdown and post-lockdown periods compared to content posted during 2019 across subreddit-genders. However, we also observed a decrease in affective MSL during lockdown, which is considered less susceptible to the dampening effect of stress and load (Luyten & Fonagy, 2015). As for the self-other mentalizing dimension, we found a decrease in other-mentalizing content during the COVID-19 pandemic in the two other-focused measures across both time-periods; during lockdown there was also a decrease in use of first-person pronouns.

The decreased affective- and self-mentalizing content under lockdown raise the possibility that for parents, these aspect of mentalizing could be somewhat effortful, perhaps only when demands and stress are particularly high. Although the gender by year interaction was nonsignificant, descriptively, the decrease in affective mentalization content appears to be mainly driven by paternal posts, such that there

may be gender differences in the need for effortful control in affective mentalizing. Parents generally referred less to affective than to cognitive terms, with a median of one affective term, and thus it is also possible that a floor effect added to this pattern.

A possible alternative explanation for the decrease in references to others may be related to the social isolation the pandemic imposed, rendering parents' external social interactions narrower. Parents posted more during the pandemic compared to 2019, perhaps implying increased use of social media to compensate for the decreased social interaction. Nonetheless, the descriptive content analysis we conducted also showed that during the pandemic, family-related terms referred more to parents and less to children compared to 2019, indicating a particular change within the family setting, possibly driving the decrease in references to others and their mental states. It is possible that parents' posts dealt more with issues related to themselves and their partners, and perhaps included more distancing language (e.g., talking about oneself in second-person or as "mom" or "dad," and citing conversations verbatim), which could be related to low mentalizing (Slade et al., 2007) but also to emotion regulation (Orvell, Ayduk, Moser, Gelman, & Kross, 2019).

Implications on understanding parenting and family functioning in the pandemic. The observed decrease in parental mentalization content during the pandemic was with small effect-sizes (e.g., 4% decrease in MSL during lockdown across subreddit genders, 2% in general parenting subreddits), consistent with the smaller effect sizes observed in large-scale or multi-site studies (e.g., Funder & Ozer, 2019; Owens et al., 2021). According to Funder and Ozer (2019), small effect sizes may be meaningful if they have the potential to accumulate over events. The effects reported here reflect changes in MSL in short posts, with a mean length of about one paragraph; over several interactions with other parents and family members, this effect has the potential to accumulate in shaping changes in mentalizing, especially given the intensity of family relationships during the COVID-19 pandemic.

Although in the present study mentalization was not measured at home and thus cannot speak directly to family interactions, it is plausible that the average decrease in parental mentalization observed here in online parental content may have also manifested in the home environment, with the potential to

negatively impact family adjustment to the pandemic. Maintenance of high levels of mentalizing when adapting to the acute change in everyday life evoked by the pandemic, could facilitate the child in coping with and adjusting to the uncertainty, changing routines, and limited social interactions, while maintaining psychological resilience (Luyten et al., 2020). Previous studies have associated higher parental mentalization with child socioemotional functioning and adjustment (e.g., Londono Tobon et al., 2020), especially in contexts of adversity (Ensink, Bégin, Normandin, & Fonagy, 2017; Meins, Centifanti, Fernyhough, & Fishburn, 2013), including during the pandemic (Cohodes, McCauley, & Gee, 2021). Parental mentalization has also been associated with cooperative coparenting and positive marital relationships (Jessee et al., 2018; Marcu, Oppenheim, & Koren-Karie, 2016), which may assist the entire family unit adjusting to the COVID-19 pandemic. Increased instances of abusive behaviors such as calling the child “stupid” or other degrading names have been reported during lockdown (Sari, van IJzendoorn, Jansen, Bakermans-Kranenburg, & Riem, 2021), an effect that may be related to distortions in understanding of the child’s intentions and motivations (often termed “pre-mentalizing”). The less pronounced effect of the pandemic on mentalization content after the initial lockdown paints a more optimistic picture, perhaps suggesting a trend towards recovery after restrictions were lifted. Nevertheless, even if this effect was only temporary in most families, this intensive period in family life could continue to impact subsequent interactions and this should be further investigated.

Gender Differences in Parental Mentalization and the Pandemic

We also observed robust differences between mothers and fathers (determined based on subreddit gender category), with posts on paternal subreddits exhibiting the lowest levels of mentalizing. Previous findings on gender differences in parental mentalization have been mixed, with some reporting lower levels of mentalizing among fathers compared to mothers (e.g., Ruiz, Witting, Ahnert, & Piskernik, 2020; Salo et al., 2021), and others reporting no differences (e.g., Borelli et al., 2016; Gershy & Gray, 2018). Our study adds to the literature by documenting consistent gender differences in spontaneous online discourse while communicating with other parents of the same gender identity.

Unexpectedly, paternal subreddits exhibited the strongest decline in mentalizing content during the pandemic, while declines in mentalizing were only partially evident in maternal subreddits. However, mentalizing was lower during the pandemic on general subreddits, the majority of sampled posts, which likely included both mothers and fathers. Therefore, maternal mentalizing may have also decreased during the COVID-19 pandemic, but to a smaller extent or not in the context of maternal-specific posts. We did not have a directional hypothesis with respect to gender differences in the effect of the COVID-19 pandemic during lockdown, as both mothers and fathers reported increased emotional distress and increased caregiving demands (Carlson et al., 2020; Dunatchik et al., 2021; Taubman-Ben-Ari et al., 2021; Wade et al., 2021; Zamarro & Prados, 2021). Considering the accumulating caregiving burden on mothers as the pandemic progressed, we hypothesized that mothers would show a larger decrease in mentalizing over time, primarily post-lockdown. However, the results did not support this hypothesis.

Why did fathers exhibit a stronger decline in mentalizing on social media during the pandemic? One possibility is that fathers are more reactive to changes in stress levels than mothers, such that maternal mentalization may be less impacted by stress. For example, men may tend to exhibit stronger cortisol reactivity to stress (Liu et al., 2017), possibly rendering their mentalization capacities more susceptible to stress (Tollenaar & Overgaauw, 2020). Furthermore, although mothers have carried most of the caregiving burden during the pandemic (e.g., Wade et al., 2021; Zamarro & Prados, 2021), because mothers have been the primary caregiver in most families before the pandemic, it is possible that the mere increase in fathers' participation in caregiving created a qualitatively different change for fathers.

Patterns of social-media use and the topics discussed on gender-specific subreddits may have also impacted the differential change in mentalizing by gender. Prior to the COVID-19 pandemic some topics of discussion were common across the three largest parenting-related subreddits (r/Parenting, r/Mommit, and r/daddit), whereas other content differed between Mommit and daddit (Ammari et al., 2018). For example, mothers discussed child health-related issues and household maintenance, whereas fathers discussed custody battles and Halloween costumes (likely less relevant to the timepoints we sampled). The inclusion of our pronoun analysis evidenced that mothers wrote longer posts and tended to refer to

themselves more in their posts compared to fathers. Mothers have been using social media for support during stressful times prior to the pandemic (Haslam, Tee, & Baker, 2017; Lupton, Pedersen, & Thomas, 2016), and the topics discussed prior to the pandemic relate to caregiving demands, such that it is possible that the COVID-19 pandemic has increased their use of these platforms for support, but not necessarily their usage patterns or discussion topics. For fathers, it is possible that the aims and usage of social media have qualitatively changed during the pandemic, also manifesting in MSL changes. Finally, fathers who engage in online discussions on parenting, specifically on fathers-specific subreddits, may represent fathers who are more involved in caregiving and have experienced greater COVID-19 pandemic-related stress. Conversely, given the saliency of custody issues on daddit (Ammari et al., 2018), it is also possible that some fathers participating in paternal-specific online discussions have faced new difficulties in navigating custody-related problems during lockdowns. Therefore, some of the observed changes may reflect the impact of the pandemic on topics already discussed on more general versus fathers-specific topics, rather than gender differences per se in response to the pandemic. We encourage future studies to explore demographic and personality correlates of parents use of Reddit to gain more insights on who, how, when, and why mothers and fathers use gender-specific and general parenting subreddits.

Strengths, Limitations, and Future Directions

This study highlights the usefulness of social media behavior for gaining insights into parents' experiences in general, and specifically their mentalizing. Despite the importance of the community in family functioning and in families' reactivity to stress (Bronfenbrenner, 1986; Deater-Deckard & Panneton, 2017), parents' interactions with other parents have rarely been examined. Parenting social media data provides access to ecological sources of natural parental discourse within the parenting community at a significant scale that may not be possible in other research settings.

Use of MSL in natural discourse has high face validity for assessing mentalizing (c.f., Meins & Fernyhough, 2015; Ruffman et al., 2002). We utilized several operationalizations to assess MSL in parental posts, from counting mental-state terms to use of verbs on a physical-mental dimension, and the

generally-converging findings in the theoretically-expected directions strengthen their validity. However, although MSL is a valid proxy for the existence of spontaneous mentalizing in general, the extent to which this type of mentalizing also generalizes to the home environment and the parent-child relationship is yet to be determined. In light of prior indications that the content of parenting subreddits deals directly with issues related to parenting practices and problems (Ammari et al., 2018), and that parents report using social media for support (Haslam et al., 2017), it is likely that effects observed on social media either reflect past occurrences at home or would later manifest in the family context. Nonetheless, future research is needed to examine whether MSL is indeed associated with other parental mentalization assessments and parenting behavior.

Analysis of MSL in natural language produced outside of a research setting can provide an objective measure of mentalization, potentially less susceptible to biases compared to other assessment types, and more focused on state-level mentalizing, as reflecting discussion topics parents choose to engage in. Nonetheless, there are aspects of parental mentalization that an automated dictionary-based measure may overlook and thus be less accurate than manual coding, particularly of nuanced mental state misattributions (although machine-learning-based algorithms may detect nuances given enough exemplars). However, it should be noted that most measures of parental mentalization capture only some dimensions of mentalizing, and no current measure captures all dimensions (c.f., Yatziv, Kessler, et al., 2020). Moreover, some words in the MSL dictionary reflect mental states in some contexts but not in others (e.g., “affect”); however, we believe that these instances are not likely to substantially impact time-based group comparisons, and this aspect has also been accounted for in analyzing the norm-based mental-physical scores. Relatedly, our measures of other-focused mentalization cannot discern who parents were mentalizing about. Because subreddits were dedicated to parenting, we assume that on average most posts concerned their family. As parental mentalization is generally consistent across close relationships (e.g., Borelli et al., 2020; Illingworth et al., 2016), we view our assessment as tapping into mentalization in the parenting context in general, across specific dyads within the family.

The aggregation of data originating from a large international forum of parents is both a strength

and a weakness. This sample is likely to capture organic discourse from a wide range of locations, primarily across locations in North America and the UK. The comparison of the effects of global events on parenting-related constructs via social media can provide insights on state, rather than trait, changes in normative parenting among parents at large. Given the many confounds that accompany other contexts of highly stressful and demanding family contexts, such as childhood trauma exposure, neglect, or substance use, this approach may better isolate the effects of stressful caregiving contexts in normative parenting and development. Similarly, social media discourse can be used to advance the field's understanding of subgroups of parents. For instance, subreddits dedicated to pregnancy can be used to study the emergence of parental mentalization and other representational constructs (e.g., coherence) throughout the perinatal period.

Nevertheless, the pseudo-anonymity of social media users also introduces some limitations. First, we did not have information on, and could not control the representativeness of, (1) the socio-economic and ethnic composition of our sample, and (2) the locations of users, which likely varied in caregiving situations due to different restrictions in reaction to the pandemic, both within North America and the UK (from which the majority of Reddit traffic typically originates; Alexa.com, 2021a; Statista.com, 2021) as well in other countries, especially post-lockdown (Ballotpedia.org, 2021a). Thus, selection biases may be present, as the sample may be more likely to include primarily White Americans with some college education (Alexa.com, 2021a; Pew Research Center, 2016). Considering evidence for higher risk for pandemic-related stress among non-White mothers (Brown et al., 2020), the effect of the pandemic on maternal mentalization may be underestimated. To better understand the specific effects of lockdowns and school closures/reopening, future studies should consider sampling social media originating from specific locations based on the local time course of the pandemic.

Second, we did not have information on the levels of stress and parenting demands that parents had experienced while interacting online. Although increased rates of distress have been reported among parents during lockdown at the group level (APA, 2020; Cameron et al., 2020; Gassman-Pines et al., 2020; Patrick et al., 2020; Racine et al., 2021), there are also individual differences in parents' stress

response to the pandemic (e.g., Brown et al., 2020; Taubman-Ben-Ari et al., 2021). Our analyses have focused on group-level changes in a large community of parents, and as such likely capture the average experience of parents. The keyness analysis supported the saliency of stress- and challenges-related terms specifically during the lockdown period, consistent with the premise that COVID-19 pandemic-related caregiving demands and stress could drive at least some of the change in parents' mentalization content. Nonetheless, individual-level stress reactivity patterns may interact with the identities of parents posting online. Furthermore, other alternative mechanisms may have driven the effect as well, including a lack of social interactions.

Clinical Implications

From a clinical perspective, our findings corroborate the assumption that mentalizing is compromised under demanding or stressful caregiving contexts. Parent-child interventions have targeted parental mentalizing abilities as means to foster positive parent-child relationships through improving parents' understanding of their own and their child's minds (e.g., Slade et al., 2019). The present findings further highlight the importance of understanding and addressing the demands of parenting within interventions that focus on parental mentalization, perhaps even before addressing mentalizing itself. Our findings add that this may be especially important when working with fathers – especially when there tend to be many barriers to fathers' participation in parenting interventions and preventive programs (Panter-Brick et al., 2014). Furthermore, during global events such as the current pandemic, public services providing resources to parents on ways to maintain a mentalizing stance could potentially help families adjust to these events and prevent psychopathology (Luyten et al., 2020).

Summary and Conclusions

The findings of the present study indicate that parents' ability to mentalize and consider mental states, especially concerning others, decreased during the COVID-19 pandemic, and particularly during lockdown. Given the importance of mentalizing for family relationships and adjustment, this may have potentially exacerbated the negative impact of the COVID-19 pandemic on the daily lives of parents and

children. Importantly, fathers using paternal subreddits exhibited the lowest baseline levels of mentalizing content and the highest decreases in mentalizing content during the COVID-19 pandemic, emphasizing the importance of paying more scientific and clinical attention to understanding fathers' experiences, especially under contexts of high family stress and caregiving demands.

Author Contributions

T.Y. and H.J.V.R. developed the study concept. All authors contributed to the study design and creation of measures. T.Y., N.M., and A.S. acquired the data. T.Y. and A.S. conducted the data analysis and interpretation, consulting with H.J.V.R. and M.G. The paper was drafted by T.Y. and H.J.V.R., and M.G. and A.S. provided critical revisions. All authors approved the final version of the paper for submission.

Declaration of Conflict

The authors declare no conflicts of interest with respect to the authorship or the publication of this article.

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