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Emotion differentiation during the transition to parenthood—Concurrent and prospective positive effects

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Abstract

Emotion differentiation, the extent to which same-valenced emotions are experienced as distinct, has been found to be associated with various positive outcomes. However, little is known about its role in relational contexts. The present work examines couples in the transition to parenthood, a particularly emotionally demanding period, and explores the associations between emotion differentiation and both concurrent (3-month post-partum) and prospective (6-month post-partum) relationship quality adjusting for pre-partum relationship quality. Both negative emotion differentiation (NED) and positive emotion differentiation (PED) were computed from daily affect ratings completed over 21 days by both partners in 88 couples. They were then examined as predictors of relationship quality (relationship satisfaction and perceived partner responsiveness) using actor–partner interdependence models. NED was found to be concurrently associated with elevated perceived partner responsiveness for one's self and for one's partner, and with elevated relationship satisfaction when the partner's NED was low. Positive emotion differentiation was found to be concurrently associated with relationship satisfaction for one's self and one's partner. Prospectively, partner NED and partner PED were associated with greater relationship satisfaction. The findings suggest that NED may function as a compensatory or shared dyadic resource, and that PED, whose effects in previous studies have been mixed, may also be constructive. Individuals undergoing emotionally

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demanding periods (such as the transition to parenthood) may benefit from developing more nuanced emotional experiences.

Keywords
Emotion differentiation, transition to parenthood, actor–partner interdependence models, relationship quality

Individuals experience their emotions in diverse ways. Beyond such basic characteristics as the emotions' valence and arousal levels, their intensity, or their variability, another aspect—emotion differentiation (ED)—has been gaining attention over the last two decades (e.g., Barrett et al., 2001; Erbas et al., 2019). Emotion differentiation is defined as the extent to which emotions are experienced in a specific or granular manner. Individuals with higher ED tend to describe their experienced emotions using discrete terms (e.g., "excited," "anxious," or "tense"), rather than abstract and general terms (e.g., "good" and "bad"), and tend to have less overlap (i.e., weaker associations) among same-valenced emotions across time.

Greater ED (or emotional granularity) may provide valuable information about the origin of any emotion and the optimal course for regulating it or adapting to it. It may also clarify relevant motivations and consequently help allocate attentional and behavioral resources more efficiently (Kashdan et al., 2015). These consequences of ED may be most pronounced in relational situations or contexts and/or in ones marked by intense emotions requiring processing and regulation. For example, Lazarus and Fisher (2021) showed that differentiation among negative emotions is beneficial for patients undergoing psychotherapy.

Another emotionally demanding context is the transition to parenthood (TTP)—the period of time spanning the birth of a parent's (or couple's) first child, typically extending from several months or weeks pre-partum until several months post-partum. This transition is experienced by many (if not most) adults and involves fundamental life changes as well as powerful emotional experiences, both positive and negative. In the present work, we sought to explore the role played by post-partum emotion differentiation in this exciting but challenging juncture.

Emotion differentiation

Greater differentiation among emotions, particularly among negative ones, has been tied to various positive outcomes in numerous studies (for reviews, see Kashdan et al., 2015; Seah & Coifman, 2021; Smidt & Suvak, 2015). For example, negative emotion differentiation (NED) has been tied to greater effectiveness of negative emotion down-regulation strategies (Kalokerinos et al., 2019), greater self-esteem, lower neuroticism, and less depressive feelings (Erbas et al., 2019; Willroth et al., 2020). Additionally, NED was found to serve as a protective factor in the face of various daily stressors (in a community sample—Starr et al., 2017; among teenagers—Nook et al., 2021), and of the

negative outcomes of ruminations (in clinical samples—Seah et al., 2020; Zaki et al., 2013).

Emotion differentiation, especially NED, appears to be associated to positive processes and outcomes in a variety of life stages and social contexts. For example, among adolescents, NED was found to be tied to indices of well-being and to buffer against the impact of stressful life events on internalizing symptoms (Lennarz et al., 2018). Similarly, among adult romantic couples, NED has been shown to predict greater empathic accuracy (Erbas et al., 2016) and to moderate the negative effects of relational conflict (Sened et al., 2018). Additionally, NED was found to be associated with more accurate recognition of others' emotions (Israelashvili et al., 2019), and psychotherapy clients with greater NED across psychotherapy sessions showed greater self-compassion (Galili-Weinstock et al., 2019).

Unlike the growing evidence linking NED to adaptive outcomes, findings regarding positive emotion differentiation (PED) have been less consistent. Whereas some studies (Dixon-Gordon et al., 2014; Selby et al., 2014) reported associations between PED and psychological well-being, others (e.g., Barrett et al., 2001; Demiralp et al., 2012; Kashdan & Farmer, 2014; Willroth et al., 2020) did not. Importantly, effects for PED have been documented only under specific conditions, such as among participants with sub-clinical eating disorders (Selby et al., 2014) or in conjunction with borderline personality features (Dixon-Gordon et al., 2014). Notably, in much of the emotion differentiation literature PED and its effects have simply not been examined or reported (for review, see Kashdan et al., 2015). At the same time, several theoretical accounts highlight the merit of delineating clear functional distinctions between different positive emotions (Shiota et al., 2014; Weidman & Tracy, 2020), and appear to argue for the adaptive value in differentiated experience of these emotions (See Liu et al., 2019 for a more comprehensive discussion). Thus, further research is clearly needed to better understand PED.

Most extant studies of emotion differentiation (and particularly of NED) document its cross-sectional association with indices of psychological health. Although suggestive, such findings fall short of demonstrating any *active role* for differentiation in changes or development of well-being. Taking steps to address this shortfall, recent work has begun to examine the predictive validity of emotion differentiation. In one such study, NED (but not PED) was shown to moderate the association between stressful life events and increases in adolescents' depression 18 months later (Starr et al., 2019). In contrast, Liu et al. (2019) did not find direct prospective effect for NED but did find it to interact with rumination to predict significant changes in depression; interestingly, a similar effect emerged for PED.

The transition to parenthood

The present study joins efforts to explore both personal and relational effects of emotion differentiation, by studying it during a specific and often dramatic juncture in individuals' lives: namely, the TTP (Doss & Rhoades, 2017). The TTP is typically a time of great joy and excitement, but also of great stress (Cowan & Cowan, 2000), replete with profound role changes, financial burdens, fatigue, and excessive work (Belsky & Pensky, 1988).

Importantly, the nature of the TTP as a dynamic life-changing unfolding process affords both contemporaneous and prospective exploration of the associations between differentiation and a variety of outcomes, including child outcomes, personal well-being, and relational quality. Of these, the latter outcome is particularly interesting and will be the focus of the present investigation.

Several large-scale studies support the idea that the TTP may be marked by a precipitous decline in partners' relationship satisfaction (e.g., Doss et al., 2009; Lawrence et al., 2008). Recent years have seen many attempts to identify factors that exacerbate or moderate this decline (for review see Nelson et al., 2014) including infant characteristics (e.g., Feeney et al., 2001), socio-economic aspects (e.g., Cox et al., 1999), relational factors (e.g., Doss et al., 2009), and parental personality traits (e.g., Trillingsgaard et al., 2014). To date, the manner(s) in which new parents experience and regulate their emotion and the roles that these play in relationship quality changes have received only limited attention.

Most affect-related TTP research has focused on mothers' (for review see O'hara & McCabe, 2013) and fathers' (Paulson & Bazemore, 2010) post-partum depression and/or anxiety; depression in particular is quite prevalent in this period for both mothers (around 17%; Shorey et al., 2018) and fathers (around 10%; Rao et al., 2020), and is very consequential for their infants' development (e.g., Feldman et al., 2009; for review see Aktar & Bögels, 2017). Much less work, however, has addressed the role of non-pathological emotional processes in the TTP, though several calls have been made to study emotions and their regulation in parenthood (e.g., Hajal & Paley, 2020; Rutherford et al., 2015).

A comprehensive and representative account of young parents' emotional experiences requires *repeated* and *ecological* measurement of their emotions as they go about their daily life in their natural environment. Methods such as daily diaries (Bolger et al., 2003) or experience sampling (Hektner et al., 2007) allow for such measurement and have become widely used in various fields of psychological research; to date, however, only a small number of TTP or early parenting studies have used such methods to explore affective processes. For example, Hajal et al. (2019) used four daily phone interviews for 6 days to explore momentary associations between affect, motivations, and behaviors in mothers of 14- to 24-month-old infants. Some unexpected findings emerged, possibly due to the context of the TTP. Specifically, behavioral and motivational measures of engagement were relatively weakly associated, and the association between irritation/anger and engagement was negative; in fact, other than concern/worry, no emotions were associated with actual behaviors.

The present study

We set out to examine the concurrent and prospective associations between NED or PED and young parents' relationship quality using the daily diary method. NED and PED were extracted from daily diaries completed 3-month post-partum. For the concurrent analyses, relationship quality indices were measured just before commencing the daily diaries. For the prospective models, relationship quality outcome and baseline indices were measured

3 months after and before the daily diaries, respectively. Hence, in these models NED and PED can be considered as predictors of changes in relationship quality.

To address the dyadic nature of couples' well-being we used the Actor–Partner Interdependence Model (APIM, Kenny et al., 2006). The APIM is a data-analytic approach designed to simultaneously estimate actor effects (in the present case, the associations between the actor's NED or PED and their own relationship quality) and partner effects (i.e., the associations between the partner's NED or PED and the *actor's* relationship quality). Additionally, to account for possible interactive effects of actor and partner ED scores, we estimated their multiplicative interaction terms. These terms can represent the extent to which NED or PED function as a compensatory or shared couple resources—that is, the extent to which their effect for one partner differ at varying levels of the effect for the other. The following hypotheses guided our work:

First, we expected the *actors'* NED to be associated with their own relationship quality ratings both concurrently and prospectively. We reasoned that individuals better able to distinguish among their negative emotions will be able to harness adaptive emotion regulation processes (Kalokerinos et al., 2019) and thus buffer the effect of various stressors (Starr et al., 2017) in way that protect or even benefit their relationship, especially during the challenging TTP period. Second, we also expected that *partners'* NED will be associated with the actors' relationship quality ratings both concurrently and prospectively; although no partner effects for NED have been reported to date, poor emotion regulation techniques have been found to exert partner effects (e.g., Klein et al., 2016; Parkinson et al., 2016). Last, we expected that the association between the actors' NED and relationship quality will be higher for actors whose partners' NED is lower; we expected this shared resource pattern to be true both concurrently and prospectively. We reasoned that low partner NED may exacerbate the emotional challenge and thus render the role of the actor's NED as more central.

Alongside NED (whose relevance to the stressors of the TTP is clear), we also explored PED as we reasoned that the TTP period may involve various rewarding, uplifting, and exciting events likely to generate positive emotions. However, unlike our strong expectations regarding the associations between actor/partner NED and relationship quality, our parallel predictions regarding PED were exploratory in nature, given the inconsistent findings obtained with this construct in the extant literature. Tentatively, we speculated that young parents who better differentiate among their positive emotions would also be better positioned to enjoy the rewards available in this period (Shiota et al., 2014). We did not expect any partner or interactive (shared resource) effects.

We estimated concurrent and prospective models for two outcome variables reflecting relationship quality: the Couples' Satisfaction Index (CSI; Funk & Rogge, 2007) which is a widely used measure of relationship satisfaction, and Perceived Partner Responsiveness (PPR; Reis et al., 2004) which is increasingly used as a measure of individuals' feeling of being understood, validated, and cared for within their romantic relationship.

Method

Participants

A total of 108 heterosexual Israeli couples expecting their first child were recruited for a larger project on relational processes during the TTP[1], using social media, online advertising, and flyers posted around the university campus. Partners were required to be over 18 years old, cohabiting for at least 1 year. Couples expecting twins were excluded from the study. Five couples left the study after completing the background questionnaire, one additional couple left before beginning the post-partum daily diary portion, and two couples completed less than six diary entries, leaving 100 couples in the study for the pre-partum and 6-month post-partum phases. Participants ranged in age from 19 to 46 years old. On average, women were 28.7 (SD = 4.3) years old and men were 30.3 (SD = 4.1) years old. The average relationship length was 4.9 years (SD = 2.9), and 96.3% were married. 50 participants (25%) were students and 34 (17%) were unemployed.

Sample size and power. The sample size was determined based on prior similarly designed research relevant to the aims of our broad TTP project (e.g., Overall et al., 2016; Sels et al., 2020), while taking into account some attrition expected in relatively long-term longitudinal studies. The target N was 100 couples, which balanced funding constraints with the aim of having adequate statistical power to detect small to medium effects. This sample size is also comparable to that used in other recent ED studies (e.g., Starr et al., 2017, 2020). A priori power calculations were not conducted as dyadic designs that utilize multilevel models would require assuming many hypothesized parameter values regarding which we had no priors. However, and though we are aware of their flaws (e.g., Hoenig & Heisey, 2001), we did calculate posthoc power estimates. Specifically, we used a specific calculator developed for APIM (Ackerman & Kenny, 2016), to which the necessary indices from our models were entered. The detected power for the significant effects of interest (i.e., the ED indices) in all models ranged between 0.71 and 0.90.

Measures

Person-level measures

Couples' Satisfaction Index (CSI). Participants completed the shortened version of the CSI questionnaire (Funk & Rogge, 2007) at pre-partum, 3-month, and 6-month post-partum. This version includes four items: the first item asks to rate the level of happiness in the relationship on a 7-point scale, ranging from *extremely unhappy* to *perfect*, and the other three items address relational satisfaction (e.g., "how rewarding is your relationship with your partner?") and were rated on a 6-point scale ranging from *not at all* to *completely.* In our sample, the scale was found to be highly reliable (Cronbach's alpha = 0.90 for the pre-partum measurement; 0.92 for the 3-month post-partum measurement; 0.92 for the 6-month post-partum measurement).

Perceived Partner Responsiveness (PPR). Participants' PPR, that is, the extent to which they perceive their partner as understanding, validating, and caring, was assessed at the same time points as the CSI. It is a 10-item measure (Gable et al., 2006, adapted from

Reis, 2006; e.g., "My partner saw the 'real' me," "My partner understood me," and "My partner expressed liking and encouragement of me"), rated on a 7-point scale, ranging from *not at all* to *very much*. In our sample, the scale was found to be highly reliable (Cronbach's alpha = 0.94 for the pre-partum measurement; 0.96 for the 3-month post-partum measurement; 0.97 for the 6-month post-partum measurement).

Daily diary questionnaires

Profile of Mood States (POMS). Participants completed an adapted and shortened daily diary version (Cranford et al., 2006) of McNair et al. (1971) Profile of Mood States which included 17 items: nine items assessing negative moods/states (Sad, Depressed, Hopeless, Angry, Irritated, Resentful, Anxious, Restless, and Tensed), and eight items assessing positive moods/states (Worthy, Capable, Pleased, Content, Happy, Cheerful, Energetic, and Lively). Participants were asked to report their moods at the moment they were completing the questionnaires. Items were rated on a 5-point scale ranging from *not at all* to *very much.* For negative moods, the within- and between-person reliabilities were .85 and .82, respectively; for positive moods, they were .87 and .90, respectively.

Procedure

Participants received a gift card (worth approx. US$25) for participating in a pre-partum meeting and completing a background questionnaire, and additional remuneration (worth approx. US$150) for taking part in a lab visit at 15-week post-partum and then completing a 21-day daily diary at home. They were contacted again and asked to complete online follow-up questionnaires at 6 months.

To recruit couples of various socio-economic levels, and to facilitate their participation, RAs traveled to participants' homes for the initial meeting (held in the third trimester of pregnancy) and to provide baby-sitting (for the 15-week lab visit). The recruited sample was indeed diverse in economic status: 9.6% of the couples had monthly family income of less than US$1350; 21.1% had monthly family income ranges from US$1350 to US$2700; 34.2% had monthly family income ranges from US$2700 to US$4050; 15.8% had monthly family income ranges from US$4050 to US$5400; and 19.3% had monthly family income greater than US$5400.

The daily diaries were administered using the Qualtrics online platform. Participants were asked to complete an individual daily diary nightly (an hour before going to sleep) for a 3-week period beginning 15-week post-partum. The daily variables of interest are noted below, though the diary included additional items as well (see https://osf.io/z9y78/). Each participant received a unique subject ID to ensure privacy. Questions were asked in the same order each day and took approximately 5–10 minutes to complete. Diary completion rates were quite high, with 63.5% of participants ($N = 66$ women and $N = 61$ men) completing all 21 days of diaries, and all but one participant (a man) completing at least 14 days of the diaries. In all, women completed a total of 2042 days of diaries and men completed 2025 days of diaries.

Analytic approach[2]

Calculating emotion differentiation. Negative and positive ED indices for each participant were calculated using the average intra-class correlation (ICC; Shrout & Fleiss, 1979), which is common procedure (e.g., Erbas et al., 2019; Starr et al., 2017). ICC values between 0 and 1 are interpretable (Giraudeau, 1996). Although negative values are mathematically possible, they are considered unreliable and impossible to interpret. Because this sample is not a clinical one, low variability in some participants' negative affect reports would be expected and may result in spurious negative ICC values. Hence, negative ICC scores were replaced by missing values (see also Erbas et al. (2018 and 2019)). Last, to ease interpretation, we subtracted the obtained ICCs from 1.00 so that higher ED values will represent greater differentiation.

Main models. We used multilevel modeling (with the SAS MIXED procedure) to account for the nesting of individuals (level 1) within couples (level 2). Additionally, we centered all predictors around the sample means to ease the interpretation of intercepts and of interaction effects. Significant interactions were probed by assessing the simple slopes of the predictors while the moderator was set to one *SD* above and below its mean. Both partners' mean affect across the diary period (i.e., negative and positive affect: NA and PA, respectively) were included in the model as covariates (see Erbas et al., (2019) for a similar approach and Dejonckheere et al. (2019) for a broader rationale). Last, Level 1 residuals were allowed to correlate within couples. The generic model equation was

$$RQ_{ij} = \beta_{0j} + \beta_1 + \beta_2{*}Actor\_NED_{ij} + \beta_3{*}Partner\_NED_{ij} + \beta_4{*}Actor\_NED_{ij}{*} Partner\_NED_{ij} + \beta_5{*}Actor\_NA_{ij} + \beta_6{*}Partner\_NA_{ij} + \beta_7{*}Actor\_PED_{ij}+ \beta_8{*}Partner\_PED_{ij} + \beta_9{*}Actor\_PED_{ij}{*}Partner\_PED_{ij} + \beta_{10}{*}Actor\_PA_{ij}+ \beta_{11}{*}Partner\_PA_{ij} + e_{ij}$$

where relationship quality (RQ, operationalized with any of the outcome indices tested in the current work) for person *j* of couple *i* was predicted by a fixed intercept (β_1), a random intercept (β_{0j}) quantifying the deviation of this couple RQ from the one predicted by the rest of the predictors, the fixed slopes (β_2-β_{11}), and person's *j* deviation from the RQ predicted by these effects (e_{ij}). The prospective models also adjusted for pre-partum levels of relationship quality. See Figure 1 for a visualization of our statistical model.

We tested all variables of interest in all models for gender interactions. No significant gender interactions were obtained, and thus, gender and its interactions were omitted from the reported analyses[3]. Effect sizes for specific predictors were based on Cohen's f^2. These indices represent a ratio of the unique variance explained by a given predictor above and beyond all other predictors (ΔR^2) over the variance remaining after including all predictors in the model ($1\text{-}R^2$). One participant failed to complete the 6-month post-partum questionnaire and was thus excluded, along with their partner, from the prospective analyses.

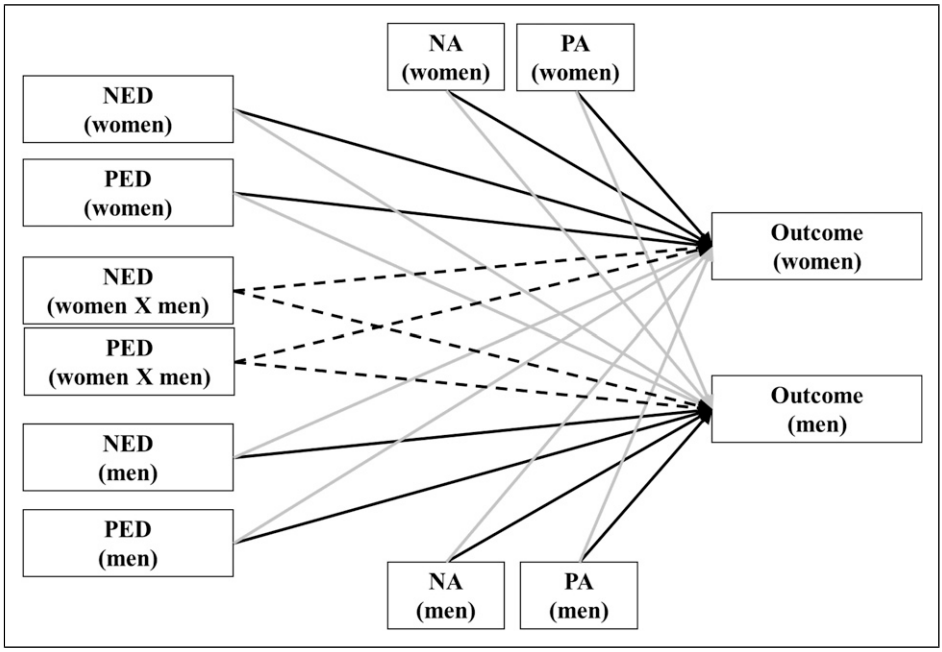

Figure 1. Statistical moderated actor–partner interdependence model for predicting relational outcomes from both partners' NED (negative emotion differentiation) and PED (positive emotion differentiation), actor-by-partner NED and PED interactions, and negative (NA) and positive (PA) affect as covariates. Solid lines represent direct effects; dashed lines represent moderation effects; bold lines are actor effects; and gray lines are partner effects. Notably, this was the initial estimated model; however, as no significant gender effects were found, the results reported in the text and tables are based on a model in which all effects were pooled across gender.

Results

Descriptive statistics, zero-order correlations, and preliminary analyses

In keeping with the analytic approach, we began by computing NED and PED indices and removing those couples ($N = 9$) for whom at least one ED (ICC) index was negative. Additionally, two couples' mood reports had no variance, making ICC calculation impossible, and one couple had a single non-zero mood report (creating a spurious perfect differentiation score). After removing these three couples, the final sample included 88 couples. The intercorrelations among the ED indices, affect means, and outcome/control variables, as well as these variables' means for the remaining couples are presented in Table 1. The correlation between men's and women's NED was 0.20 ($p = .058$) and between men's and women's PED was 0.24 ($p = .022$). No significant gender differences emerged for either NED or PED.

Table 1. Zero-order correlations among the study's variables.

Variable	1	2	3	4	5	6	7	8	9	10
1. NED		0.19[a]	−0.49***	0.24*	0.23*	0.40***	0.33**	0.38***	0.50***	0.35***
2. PED	0.39***		−0.26*	0.12	0.10	0.27*	0.14	0.23*	0.27*	0.18†
3. Mean NA	−0.29**	−0.31**		−0.38***	−0.32*	−0.42***	−0.41***	−0.47***	−0.56***	−0.49***
4. Mean PA	0.35***	0.14	−0.39***		0.34**	0.40***	0.44***	0.33**	0.35***	0.33**
5. Pre-partum CSI	0.31**	0.24**	−0.28**	0.34**		0.73***	0.64***	0.67***	0.62***	0.59***
6. 3-month CSI	0.28**	0.34**	−0.34**	0.25*	0.72***		0.75***	0.65***	0.77***	0.66***
7. 6-month CSI	0.28**	0.24*	−0.40***	0.36***	0.66***	0.77***		0.58***	0.66***	0.83***
8. Pre-partum PPR	0.25**	0.24*	−0.29**	0.39***	0.75***	0.65***	0.60***		0.82***	0.69***
9. 3-month PPR	0.28**	0.34**	−0.28**	0.29**	0.61***	0.80***	0.68***	0.77***		0.77***
10. 6-Month PPR	0.31***	0.35***	−0.49***	0.44***	0.66***	0.70***	0.85***	0.73***	0.78***	
Women mean	0.30	0.30	0.38	2.25	18.83	16.51	15.99	8.05	7.68	7.41
Women *SD*	0.20	0.18	0.29	0.54	2.29	3.70	3.70	0.84	1.29	1.29
Men mean	0.34	0.35	0.38	2.25	18.30	16.88	16.03	7.77	7.31	7.18
Men *SD*	0.22	0.21	0.39	0.60	2.75	3.73	4.08	1.08	1.49	1.56

Note. Men's correlations are below the diagonal; women's correlations are above the diagonal.
NED = negative emotion differentiation; PED = positive emotion differentiation; NA = negative affect; PA = positive affect; CSI = Couple Satisfaction Index; PPR = Perceived Partner Responsiveness.
N = 88 couples (N = 87 for correlation involving the 6-month measures).
[a]$p<.1$. *$p<.05$. **$p<.01$. ***$p<.001$.

Table 2. Results of the multilevel models predicting concurrent outcomes.

Predictor/ outcome	CSI				PPR			
	B(*SE*)	t (*df*)	*p*	*E.S.*[a]	B(*SE*)	t (*df*)	*p*	*E.S.*[a]
(Constant)	17.07 (0.28)	61.35 (81)	<.001		7.69 (0.10)	73.92 (81.1)	<.001	
Actor NED	2.03 (1.26)	1.61 (153)	.109	0.01	1.09 (0.48)	2.29 (150)	.023	0.02
Partner NED	2.01 (1.24)	1.62 (147)	.108	0.01	1.03 (0.46)	2.24 (133)	.027	0.03
Actor * partner NED	−13.59 (5.42)	−2.51 (81)	.014	0.05	−3.20 (2.02)	−1.58 (80.4)	.118	0.02
Actor mean NA	−1.17 (0.80)	−1.47 (153)	.144	0.01	−0.81 (0.31)	−2.61 (162)	.010	0.02
Partner mean NA	−1.38 (0.77)	−1.78 (139)	.077	0.02	−0.41 (0.28)	−1.45 (121)	.150	0.01
Actor PED	3.23 (1.29)	2.51 (160)	.013	0.04	0.92 (0.49)	1.88 (156)	.062	0.03
Partner PED	3.05 (1.27)	2.40 (153)	.018	0.03	0.59 (0.47)	1.27 (137)	.208	0.01
Actor * partner PED	1.74 (6.76)	0.26 (81)	.797	0.00	−0.42 (2.53)	−0.17 (80.6)	.869	0.00
Actor mean PA	1.11 (0.46)	2.40 (165)	.018	0.03	0.43 (0.17)	2.45 (156)	.016	0.04
Partner mean PA	0.41 (0.46)	0.88 (161)	.378	0.00	−0.15 (0.17)	−0.85 (144)	.395	0.00

Note. CSI = Couple Satisfaction Index; NA = negative affect; NED = negative emotion differentiation; PA = positive affect; PED = positive emotion differentiation; PPR = Perceived Partner Responsiveness.
[a]Cohen's f^2.

Predicting concurrent relationship quality[4,5]

The results of the model predicting concurrent CSI are presented in the left panel of Table 2. Actor and partner NED were not associated with greater CSI, but the actor-by-partner interaction for NED was significant. Probing this interaction (see Figure 2), we found that the association between actor NED and CSI was positive and significant for actors whose partners were low in NED (-*SD*; $b = 5.02$, $SE = 1.72$, $p = .004$) but was non-significant for actors whose partners were high in NED (+*SD*; $b = -0.96$ $SE = 1.75$, $p = .584$). Additionally, both actor and partner PED were significantly associated with greater CSI. Last, mean partner NA was marginally associated with lower concurrent CSI and mean actor PA was associated with greater CSI.

The results of the model predicting concurrent PPR are presented in the right panel of Table 2. Both actor and partner NED were significantly associated with greater PPR.

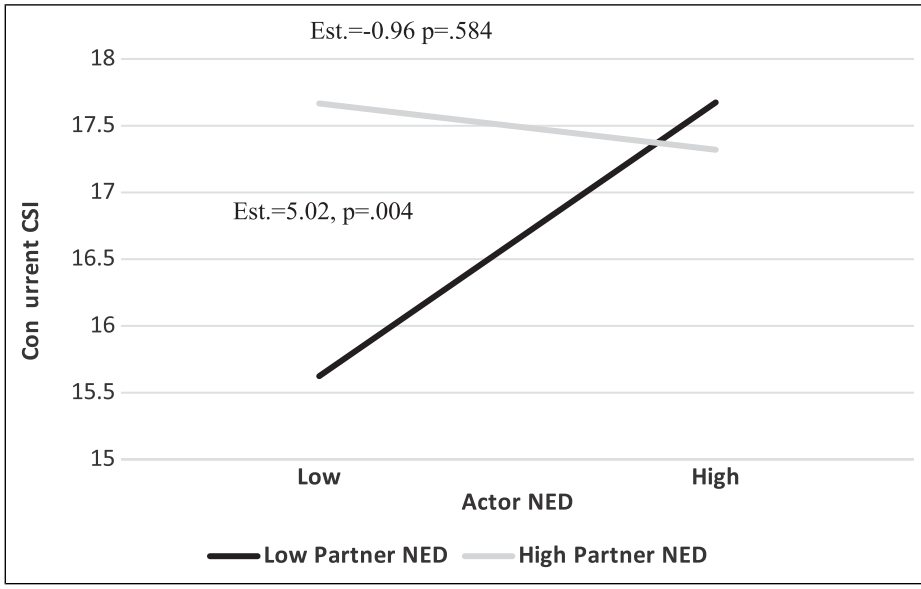

Figure 2. Effects of actor NED on concurrent CSI for high (+1 *SD*) and low (−1 *SD*) partner NED.

Additionally, actor PED was marginally associated with greater PPR. Last, mean actor NA was associated with lower concurrent PPR and mean actor PA was associated with greater PPR.

Predicting prospective relationship quality

The results of the model predicting prospective CSI are presented in the left panel of Table 3. Partner NED was significantly associated with greater CSI. Additionally, partner PED was significantly associated with greater CSI. Last, mean partner NA was significantly associated with lower prospective CSI and mean actor PA was associated with greater CSI.

The results of the model predicting prospective PPR are presented in the right panel of Table 3. Partner NED was marginally associated with greater PPR. Additionally, mean actor NA and mean partner NA (marginally) were associated with lower prospective PPR. Last, mean actor PA was marginally associated with greater PPR.

Discussion

Growing evidence points to the positive role that ED (mostly of negative emotions) can play in individuals' psychological health. However, few studies have examined ED within relational contexts or during demanding periods, when emotions and their regulation are likely to be particularly consequential. The present work sought to examine ED among

Table 3. Results of the multilevel models predicting prospective outcomes.

Predictor/ outcome	CSI				PPR			
	B(*SE*)	t (*df*)	*p*	*E.S.*[a]	B(*SE*)	t (*df*)	*p*	*E.S.*[a]
(Constant)	16.26 (0.26)	61.62 (79.2)	<.001		7.36 (0.10)	77.13 (78.1)	<.001	
Actor NED	0.82 (1.09)	0.75 (127)	.457	0.00	0.14 (0.38)	0.37 (118)	.715	0.00
Partner NED	2.34 (1.07)	2.18 (118)	.031	0.02	0.69 (0.38)	1.81 (115)	.073	0.02
Actor * partner NED	−7.29 (5.15)	−1.42 (79.3)	.161	0.01	−0.24 (1.86)	−0.13 (77.8)	.896	0.00
Actor mean NA	−1.19 (0.69)	−1.71 (139)	.090	0.03	−0.91 (0.24)	−3.8 (125)	<.001	0.11
Partner mean NA	−1.61 (0.65)	−2.47 (115)	.015	0.06	−0.41 (0.23)	−1.78 (117)	.078	0.02
Actor PED	0.54 (1.10)	0.49 (135)	.627	0.00	0.49 (0.39)	1.26 (126)	.212	0.01
Partner PED	2.30 (1.08)	2.13 (124)	.036	0.02	0.22 (0.38)	0.57 (121)	.572	0.00
Actor * partner PED	0.66 (6.43)	0.10 (79.6)	.919	0.00	0.38 (2.32)	0.16 (77.9)	.871	0.00
Actor mean PA	1.24 (0.40)	3.13 (148)	.002	0.04	0.27 (0.14)	1.95 (144)	.053	0.03
Partner mean PA	−0.04 (0.38)	−0.09 (140)	.925	0.00	−0.14 (0.13)	−1.01 (138)	.315	0.00
Pre-partum CSI/PPR	0.58 (0.09)	6.62 (159)	<.001	0.36	0.67 (0.07)	9.23 (127)	<.001	0.56

Note. CSI = Couple Satisfaction Index; NA = negative affect; NED = negative emotion differentiation; PA = positive affect; PED = positive emotion differentiation; PPR = Perceived Partner Responsiveness.
[a]Cohen's f^2.

couples going through the TTP, by exploring ED's associations with one's own and one's partner's relational well-being, both concurrently and prospectively.

In our concurrent models, the effects of *NED* were outcome dependent. Specifically, CSI was predicted by an actor-by-partner interaction indicating a stronger association with these outcomes for actors whose partners are lower in NED. For CSI, as expected, it seems that NED functions as a compensatory or shared dyadic resource: individuals benefit from their own (or their partner's) differentiation of negative emotions levels to a greater extent when their partner's (or their own) differentiation levels are lower. PPR, on the other hand, was predicted by both actor and partner NED but not by their interaction.

These findings demonstrate that beyond the frequently reported association between NED and personal well-being (e.g., Erbas et al., 2019), such differentiation is also tied to relational well-being, at least for individuals in the TTP. Many of the challenging moments of the TTP, which are likely to give rise to negative emotions, occur within a relational context. For example, in the face of a fussy and inconsolable baby, new parents

high in NED may be able to distinguish between frustration (with the situation) and anger (which may be mis-directed at their partner); by doing so, they may shield their relationship from unneeded tension. Importantly, our results indicate that relational well-being may be at a particular risk when both partners are low in NED; in other words, couples in which at least one partner is high in NED appear to fare better. This suggests that NED may be seen as a shared resource, one in which one partner's lack can be compensated by the other partner's presence of NED (akin to a similar pattern found with emotional intelligence among couples; Brackett et al., 2005).

In our prospective models, the associations between NED and changes in relationship quality measured 6-months post-partum were still present, though less robust. Specifically, partners' NED was positively associated with both outcome measures (though only marginally for PPR). The actor-by-partner interaction for NED was not significant in either of the models. These findings should be interpreted cautiously, yet they may imply that partner NED can have long-term effects for relationship satisfaction. In particular, the temporal precedence and the inclusion of pre-partum relationship quality levels in the models can strengthen the case for a causal role of partner NED. Although such inference based on non-experimental design is always limited, manipulating NED in the lab will severely hamper ecological validity. In contrast, our design can be used to provide valuable insight regarding real-life causal processes.

With regards to *PED*, our concurrent models found the actors' index to be associated with greater relationship quality (only marginally for PPR). Partner PED was found to be positively and significantly associated only with greater CSI. No significant interaction effects were obtained, suggesting that PED does not follow the same compensatory or shared resource pattern found for NED.

Although previous findings regarding PED's association with well-being have been mixed (e.g., Demiralp et al., 2012; Tugade et al., 2004), our findings suggest a relatively robust association between the two in the TTP. Indeed, the TTP may occasion positive emotions quite frequently as it affords a variety of uplifts and rewards (alongside its many stressors). For example, parents are likely to feel excitement at witnessing the baby's first smile, amusement when at coming into greater contact with the baby's playfulness, and a sense of fulfillment in moments that highlight family cohesion or flow. According to a functional approach to positive emotions (Beall & Tracy, 2017; Shiota et al., 2014), a differentiated or discretized experience of these positive emotions can help mobilize specific motivational, cognitive, physiological, and behavioral responses to prototypical eliciting situations. Young parents who are better able to experience positive emotions in such a differentiated manner may be better positioned to capitalize on the varied rewards that the TTP period provides. In contrast, non-TTP samples with whom PED was not found to play as adaptive a role may simply not have as many (or as diverse a set of) rewards and uplifts.

Finally, in our prospective models, the only association found between PED indices and subsequent changes in relationship quality was the one tying the partner's PED to greater actor relationship satisfaction. This association should be considered alongside the one tying partner's NED and both relational outcomes. These prospective partner effects for both PED and NED in the absence of counterpart actor effects may point to an

inherently interpersonal function of ED within emotionally demanding dyadic situations. Prospectively, participants' ability to differentiate among their emotions served their partners more than it did themselves. These high ED participants may have a more nuanced emotional understanding of critical (negative and positive) situations and perhaps greater empathic accuracy (Erbas et al., 2016; Israelashvili et al., 2019). Thus, they were better equipped to provide skilled social support (Rafaeli & Gleason, 2009) which may in turn increase their partner's relational well-being.

Notably and unexpectedly, our two relationship quality indices, relationship satisfaction and PPR, showed (to some extent) divergent associations with NED and PED. Specifically, PPR may have had a somewhat stronger association with NED (and not PED) because it pertains to responsiveness or support processes which may—at least in part—involve coping with stressors or hardships. In contrast, relationship satisfaction encompasses a wider set of experiences—many of which are unrelated to stress or coping—and thus, PED (more so than NED) may have more direct bearing on it.

Although not at the focus of this work, interesting associations between mean affect indices and relationship outcomes emerged. Surprisingly, given the "bad is stronger than good literature" (Baumeister et al., 2001), the most robust effect involved actor mean PA. This finding as well may reflect the importance of positive affectivity vis-à-vis the potential powerful rewards of the TTP. The impact of NA may be more apparent for the obtained NA (but not PA) partner effects. These effects, that are not inferior in terms of size, and seem to extend across time, highlight the interdependence among partners effective systems in the TTP period.

Broader considerations

Early parenthood is a critical period which may shape the development of physical and psychosocial health later in life (Saxbe et al., 2018). The study of emotional processes occurring during this period is taking its baby steps and is likely to grow over time (Hajal & Paley, 2020). As we hope our analyses have demonstrated, the new parents' affect dynamics are one important target for such investigation. Although recent work has raised questions regarding the incremental predictive validity of affect dynamics (Dejonckheere et al., 2019; Wendt et al., 2020), our results do indicate that ED is tied, at least moderately (effect sizes were small), to relational well-being—even after controlling for mean affect levels.

The study of affect dynamics employs intensive repeated measurements to capture individual differences in how affect unfolds over time. It relies on self-reports but goes beyond them, and thus helps researchers allay the risk of "halo" or "glop" effects (e.g., Forgas & Laham, 2017; Gottman et al., 2002, pp. 9–10), in which global evaluations of an entity (e.g., relationship quality) exert undue influence on the evaluation of more specific attributes (e.g., affect). Affect dynamic measures are less transparent and can be interpreted while holding constant global evaluation (e.g., PA or NA) levels, as we do.

The study is among the first to explore intraindividual affect dynamics in a dyadic context (though see Erbas et al., 2016; Lazarus et al., 2019). As affect is inherently interpersonal, studying its dynamics within an interpersonal matrix can be quite

informative. For example, it permits us to explore both actor and partner effects, thus increasing our ability to speak to these constructs causal influence.

The study of affect dynamics in the context of the TTP can go well beyond relational correlates. One interesting avenue would be to explore the association between parents' emotion differentiation and their offsprings' emotion socialization, (i.e., the influence of parents' behaviors on children's understanding of emotions, emotional expression, and emotional regulation; Denham et al., 2015; Eisenberg et al., 1998). Indeed, new parents' ability to differentiate among emotions is likely to play a major role in these socialization processes.

Relatedly, turning the spotlight to developmental questions, the factors that contribute to the development of ED across the life span are still a relatively unexplored territory (though see Nook et al., 2018). Work on emotional socialization (e.g., Cao et al., 2018) can provide guidelines for such an endeavor and may benefit from utilizing a performance-based ecologically valid measures such as ED. These measures reduce the risk inherent in correlations between self-report measures and low external validity of tasks performed in the lab.

The present study is also quite unique in demonstrating associations between PED (rather than NED) and relational well-being. These findings join others emerging from a growing number positive affect studies, which depart from the customary treatment of this construct as unitary and monolithic construct, and instead argue for the utility of recognizing discrete positive emotions and their particular roles in individuals' lives (for review, see Shiota et al., 2017).

Limitations, strengths, and future directions

Several limitations of the present study merit acknowledgment. First, like many relationship studies, our sample was biased towards relatively well-adjusted, satisfied couples. It would be important to examine similar processes among couples lower in relational adjustment. Second, to calculate our ED indices, we relied on a relatively few (namely, twenty-one) measurements per participant, collected once daily. Additionally, the measured affective states (i.e., moods) were more diffuse than the ones usually used to calculate ED (i.e., emotions). It is important to determine whether these findings would generalize to datasets in which more frequent and time-limited assessments are utilized. In that regards, the lack of significant gender effects despite the typical differences between mothers and fathers in the TTP is notable. It is possible that a more sensitive ED estimation would have been able to detect subtler effects. Third, the study's TTP context, although universally quite common, is nonetheless a circumscribed one. Future work examining other emotionally demanding contexts (e.g., periods of marital discord, or of coping with one partner's physical illness) could help clarify the breadth of ED's effects. Fourth, although our prospective models provide some information regarding the directionality of the association between ED and relational well-being, the absence of a second ED measurement prevented us from examining reverse causation (i.e., the possibility that changes in relational well-being predict ED changes; e.g., Erbas et al., 2018). Having such data would have allowed us to model the dynamic associations

between key TTP-related psychological domains (i.e., emotion regulation, depressive symptoms, and relational well-being; Cao et al., 2018). Future work employing multiple ecological momentary assessment bursts can further explore these dynamics. Fifth, demographic information regarding ethnicity, gender identity, and disability was not collected; the role of such variables in emotional processes during the TTP is an area for future research.

Conclusion

The present work showed that the ability to differentiate among emotions, both negative and positive, may be tied to one's own and one's partners relational well-being in the transition to parenthood. For negative emotions and with regards to relationship satisfaction such differentiation appears to follow a compensatory or shared dyadic resource pattern—wherein couples for who at least one partner is characterized by high differentiation appear to fare better than those in which neither partner does. Our findings suggest that emotion differentiation may be a worthy target of intervention in this important life stage.

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Open research statement

This research was not pre-registered. The data used in the research are available in https://osf.io/z9y78/. The SAS code for the analyses reported in the research are also available in https://osf.io/z9y78/. Further materials used in the research are available upon request. The materials can be obtained by emailing: gal.lazarus@gmail.com

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Notes

1. For a broader description of the project and a full list of published studies to date, see https://osf.io/z9y78/
2. Data files and the SAS code used to perform our analyses is available at https://osf.io/z9y78/
3. Tables 4S and 5S in the online supplement present the results of the models with the gender interactions. As can be seen in the tables, the effect sizes of the gender interactions were minimal.

4. We ran all the models while adjusting for a parental stress index (comprised of problems with the baby's health, mood, or other sources of stress or burdens concerning baby care). The results remained unchanged.
5. In many studies of affect dynamics, separate models for negative and positive affect are used. Here, we opted to use a single model to account for possible non-independence of effects. Still, in Tables 2S and 3S in the online supplement we provide the results of separate valenced models. Whereas results were generally similar to the combined models, some of the main effects got stronger at the expanse of the interaction effects.

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