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Self-disclosure is associated with adrenocortical attunement between new acquaintances

Katherine R. Thorson [a,*], Sarah Ketay [b], Ashlin R.K. Roy [c], Keith M. Welker [d]

[a] Dept. of Psychology, 3009 Broadway, Barnard College of Columbia University, New York, NY, USA
[b] Department of Psychology, University of Hartford, West Hartford, CT, USA
[c] Department of Neurology, University of California San Francisco, San Francisco, CA, USA
[d] Department of Psychology, University of Massachusetts Boston, Boston, MA, USA

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ABSTRACT

Adrenocortical attunement—similarity in hypothalamic-pituitary-adrenal (HPA) axis activity—has been well-documented in close relationships (e.g., between romantic partners, parents and children, and close friends). However, little is known about adrenocortical attunement during early relationship formation. In the current study, we examine dyadic adrenocortical attunement during a guided conversation in which two new acquaintances ($N = 140$ people, 70 dyads), who were university students or adults in the community, answered questions about themselves. Dyads were randomly assigned to answer questions designed to elicit dyad members to reveal a high or low amount of personal information (i.e., to self-disclose at high or low levels). We collected saliva samples (assayed for cortisol) before and after the conversation, and we coded behavioral self-disclosure—the extent to which people revealed their thoughts, feelings, and facts about themselves—during the conversation. As expected, dyads who were assigned to ask and answer high self-disclosure questions disclosed more than those assigned to ask and answer low self-disclosure questions. In addition, greater self-disclosure during the conversation was associated with greater similarity in cortisol change—that is, dyad members who revealed more about themselves experienced more similar cortisol changes in response to their conversation. This work reveals one social process through which adrenocortical attunement occurs during early relationship formation, and, in doing so, describes how our physiological functioning is linked to those around us—even people we have just met.

1. Introduction

"Whatever our souls are made of, his and mine are the same," writes Emily Brontë, recognizing the extent of shared characteristics in social relationships. One kind of similarity often seen in close relationships, and which has implications for how social relationships influence health, is similarity in physiological processes (Palumbo et al., 2017; Timmons et al., 2015). Similarity between two people's hypothalamic-pituitary-adrenal (HPA) axis activity, known as adrenocortical attunement (and also called adrenocortical synchrony or concordance), has been well-documented between romantic relationship partners (Papp et al., 2013; Saxbe and Repetti, 2010; Schreiber et al., 2006), between parents and children (Atkinson et al., 2013; Hibel et al., 2015; Sethre-Hofstad et al., 2002; van Bakel and Riksen-Walraven, 2008), and between close friends (Rankin et al., 2018). Adrenocortical attunement been associated with a range of processes in close relationships, including time spent together (Papp et al., 2009, 2013), negative affect and distress (Middlemiss et al., 2012; Papp et al., 2009), and behavioral sensitivity (Atkinson et al., 2013; Hibel et al., 2015; Sethre-Hofstad et al., 2002; van Bakel and Riksen-Walraven, 2008).

Despite at least two decades of research on adrenocortical attunement within close relationships, we know very little about adrenocortical attunement during the early stages of relationship formation—in particular, between new, adult acquaintances. In addition, although adrenocortical attunement is considered neither unilaterally adaptive nor maladaptive (Timmons et al., 2015), it is often studied in response to negative social interactions, especially those characterized by conflict (e.g., Ha et al., 2016; Hibel and Mercado, 2019; Saxbe et al., 2014). Much less research has studied the processes that contribute to attunement in positive social interactions, such as those that typically occur

* Corresponding author.
E-mail address: kthorson@barnard.edu (K.R. Thorson).

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between new acquaintances.

Studying attunement of HPA-axis activity within early relationships could help us better understand the processes through which hormonal responses become regulated and shaped by others, even those we have just met (Feldman, 2007). Because HPA-axis activity is considered one of the main pathways through which social relationships influence health, such information could also inform how interactions with new acquaintances contribute to health over time (Eisenberger and Cole, 2012). Additionally, understanding how adrenocortical attunement develops in new relationships could inform interventions aimed at promoting attunement in beneficial situations (e.g., when partners downregulate each other's distress; e.g., Bloch et al., 2014) and interrupting attunement in harmful ones (e.g., when negative emotions are transmitted from one partner to another; Dimitroff et al., 2017).

In the current work, we examine adrenocortical attunement during social interactions between new acquaintances. Although, as of yet, there is no evidence to suggest that adrenocortical attunement occurs between new acquaintances, recent work on other physiological responses supports the idea that new acquaintances can exhibit correspondence in their neurobiological responses (Thorson and West, 2018; West et al., 2017). For example, a recent study showed that newly-acquainted students showed similarity in sympathetic nervous system responses while solving math problems together (Thorson et al., 2019).

Here, we examine whether adrenocortical attunement is related to one of the most important behavioral processes underlying relationship formation: self-disclosure. Self-disclosure is the process of revealing personal information to another person, and it is a well-documented behavior that promotes liking and closeness within new relationships (Aron et al., 1997; Collins and Miller, 1994; Laurenceau et al., 2004; Reis and Shaver, 1988; Sprecher et al., 2013). Through mutual self-disclosure, new acquaintances gradually reveal more thoughts, feelings, and facts about themselves. In the current work, we provided new acquaintances with the opportunity to self-disclose during a structured 45-minute conversation, during which dyad members took turns asking and answering questions that were designed to elicit high or low levels of self-disclosure (Aron et al., 1997; Welker et al., 2014). We measured how much dyad members self-disclosed during the conversations, by coding the extent to which they revealed their thoughts, feelings, and facts about themselves. We then assessed adrenocortical attunement by measuring cortisol—the end-product of HPA axis activation and which is often associated with stress reactivity or arousal—in both dyad members before and after the conversation (Ha et al., 2016; Hibel and Mercado, 2019; Sethre-Hofstad et al., 2002).

We test the hypothesis that dyad members will disclose more when asking and answering questions designed to elicit a high level of self-disclosure versus those designed to elicit a low level of self-disclosure. We then test whether greater levels of self-disclosure during the conversation are associated with adrenocortical attunement between new acquaintances. Several studies support the idea that greater access to information about partners—as is revealed during self-disclosure—facilitates adrenocortical attunement. For example, mothers and babies are more attuned to each other during sleep training when mothers can hear their babies cry but not when they do not hear their babies cry (Middlemiss et al., 2012). Spouses tend to be more attuned to each other when they are physically together at home in the early morning and evening—times when they have access to more behavioral cues from their partners (Saxbe and Repetti, 2010)—and when they spend more time together in general (Papp et al., 2013). Similar findings exist for parents and their adolescent children: attunement is higher when pairs spend more time together and in families rated higher on shared activities and parent supervision (Papp et al., 2009). In addition, attention or sensitivity to information from others also promotes attunement, and situations that make it harder to attend to others, such as stress, disrupt attunement (Hibel et al., 2015;Sethre-Hofstad et al., 2002; Atkinson et al., 2013; van Bakel and Riksen-Walraven, 2008,). Finally, research conducted on other forms of physiological attunement (such as sympathetic nervous system activity) also suggests that attunement is higher when people have access to and pay attention to information from their partners (Marci and Orr, 2006; Murata et al., 2020; Thorson et al., 2019).

Taken together, this work suggests that one way that adrenocortical attunement occurs is through the information people provide about themselves—for example, about their current mood. This information can be expressed via different channels, like speech, paraverbal cues, or other nonverbal behaviors. When another person "receives" this information from an interaction partner, this can result in both partners having similar psychological experiences, which are reflected in similar physiological responses (Thorson et al., 2018). Based on this work, we test whether new acquaintances who reveal more information about themselves will experience more adrenocortical attunement. To our knowledge, this is the first work to examine adrenocortical attunement between new acquaintances and the first to examine whether self-disclosure is a social-behavioral process associated with attunement.

2. Material and methods

Additional methodological details and results are provided in the Supplementary Material (SM); study materials, data, and analysis syntax are available on the Open Science Framework (OSF) at https://osf.io/j4g29/

2.1. Participants

Participants were recruited from the greater Boston area through online advertisements, posted flyers, a University of Massachusetts Boston psychology subject pool, and a university-wide student email notification system ($N_{participants} = 140$, $N_{dyads} = 70$; $M_{age} = 22.94$, $SD = 6.27$; 45% male, 55% female; 31.4% Caucasian/White, 24.3% East/Pacific/South Asian, 15.7% Hispanic/Latin American, 13.6% African American/Black, 2.9% Middle Eastern, 12.1% Other/Mixed Race; 67.9% exclusively heterosexual, 16.4% mostly heterosexual, 3.6% more heterosexual, 5.0% bisexual, 2.1% more homosexual, 2.1% mostly homosexual, 2.1% exclusively homosexual). Most participants were university students (86.4% students; 9.3% non-students; 4.3% missing data). Dyad members were matched on gender to avoid concerns about dating and sexual attraction (given that most participants identified as heterosexual). Participants were compensated with a $30 Amazon.com gift card or partial class credit if they were recruited from the subject pool. To attenuate diurnal variation in hormones, study sessions occurred between the hours of 11:00 am and 5:00 pm. One dyad was excluded from data analysis a priori because the dyad members did not understand the instructions for the interaction task and completed it incorrectly. Although the sample size for this paper was not determined for the purpose of this particular analysis, a power analysis conducted in G*Power showed that we had 80% power to detect a small-to-medium effect size with this sample size.

2.2. Procedure

Upon arrival at the lab, participants provided informed consent, completed demographic and personality measures, and provided a baseline saliva sample in individual rooms. Dyad members were then moved to the same room where they met each other for the first time.

We then provided participants with questions to ask each other. Each dyad was randomly assigned to ask each other one of two sets of questions, with one set of questions designed to induce a high level of self-disclosure (and one that increased over time) and one set designed to induce a low level of self-disclosure (this variable is referred to as "question type" below; Aron et al., 1997; Welker et al., 2014). An example question designed to induce high self-disclosure is "For what in

your life do you feel most grateful?" An example question designed to induce less self-disclosure is "Do you read a newspaper often and which do you prefer?" Both participants answered every question they received but alternated in asking questions. The interactions lasted approximately 45 min and were video-recorded so that self-disclosure during the conversations could be independently coded.

After the interaction, participants returned to individual rooms. They all completed a task in which they described and answered questions about a close friend. This task was not a focus of the current paper, but the instructions and questions for the task are provided on this paper's OSF page. Participants then provided their second saliva sample approximately 20 min after the end of the conversation. We chose this timing because we expected self-disclosure to increase over the course of the conversation but at varying rates. Thus, we expected that, for each dyad, their peak level of self-disclosure would be at the end of the conversation and that, across the whole sample, peak variability of self-disclosure would be at the end of the conversation. We, therefore, reasoned that this timing would provide the best opportunity for observing a relationship between self-disclosure and adrenocortical attunement were one to exist. All materials and procedures were approved by the Institutional Review Board at University of Massachusetts Boston.

2.3. Measures

2.3.1. Adrenocortical attunement

To ensure clean saliva for hormone processing, on the day of the study, participants were asked not to exercise, eat, drink any non-water liquids, or brush their teeth during the hour prior to the study. Participants provided 3–5 mL of saliva following passive drool protocols (Granger et al., 2007) into polypropylene centrifuge tubes at two time points (directly before dyad members met each other and 20 min after their conversation ended). The samples were immediately frozen at − 30 degrees Celsius until assayed at a later date. Saliva samples were delivered to Brigham Research Assay Core, Boston, MA and assayed for cortisol using Salimetrics ELISA kits. The mean intra-assay coefficient of variation (CV) for cortisol was 9.2% and the inter-assay CV was 5.7%.

To measure adrenocortical attunement, we calculated the difference between dyad members' cortisol changes (see Clearfield et al., 2014; Crockett et al., 2013; Griffin et al., 1999 for a similar approach). To do this, we first marked as missing any cortisol concentrations (baseline and post-conversation) that were greater than three standard deviations from the mean. The average baseline cortisol concentration was then 0.11 μg/dL (SD = 0.07); the average post-conversation cortisol concentration was 0.08 μg/dL (SD = 0.05). We then calculated change scores for each participant (post-conversation value minus baseline value; M = −0.03; SD = 0.07; see Fig. 1). The finding that, on average, participants experienced a decline in cortisol is to be expected (1) given that cortisol typically decreases during the hours of the day in which we conducted this study (Schultheiss and Stanton, 2009) and (2) because getting-acquainted conversations with another person are not usually experiences that generate increases in HPA-axis activity (Dickerson & Kemeny, 2004; Ketay et al., 2019). For this reason, we refer to the differences in cortisol between baseline and post-conversation as "change" scores rather than "reactivity" scores to avoid any confusion. Finally, we found the absolute difference between the two dyad member's change scores and multiplied these values by − 1 so that higher numbers would reflect greater adrenocortical attunement (total attunement scores [one per dyad] = 63; M = −0.07; SD = 0.08).

We selected this measurement for adrenocortical attunement because it is appropriate for the type of dyads in this study—those that are indistinguishable, meaning that partners do not vary from each other on a theoretically meaningful variable (Kenny et al., 2006). Another common method predicts one dyad member's cortisol change or level from the other dyad member's cortisol change or level, respectively (e.g., across all dyads, researchers might examine whether cortisol responses of mothers predict the cortisol responses of their children; Hibel et al., 2015; Papp et al., 2009). However, this measure can only be used with distinguishable dyads—dyads in which the partners differ on a meaningful variable, like role in the family. The approach we took here—creating a difference score between both partners' change scores—can be done with indistinguishable dyads and, thus, avoids making an arbitrary selection of one partner's response as the outcome and the other as the predictor, which would bias results.

2.3.2. Self-disclosure

Three trained research assistants independently coded the recorded interactions by rating the extent to which participants revealed their (1) thoughts, (2) feelings, and (3) facts about themselves on 1 (*not at all / very little*) to 5 (*extremely*) scales. Although we coded for other aspects of the conversations as part of a larger project, these were the only three items we coded for that indicated self-disclosure. Two coders provided judgments of each participant at three time points, after each fifteen-minute interval of the interaction. One video could not be coded because of a problem with the video-recording equipment. Interrater reliability was assessed using average-measures one-way random effects

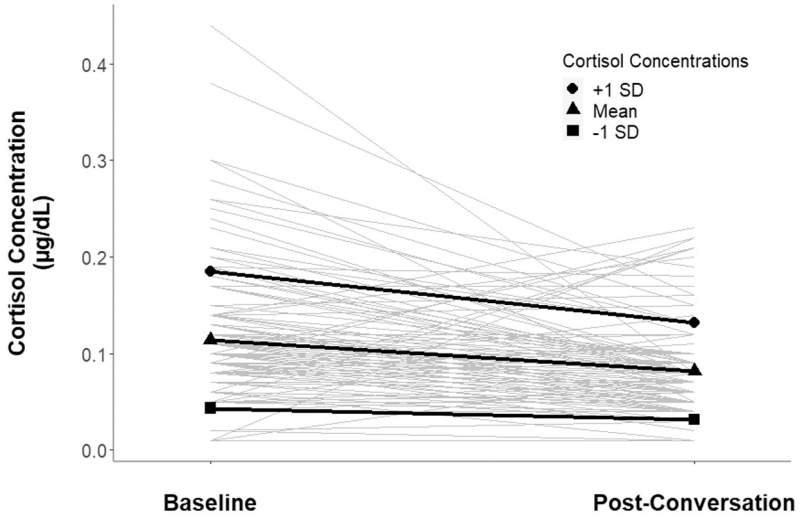

Fig. 1. Spaghetti plot showing cortisol concentrations for individual participants from baseline to post-conversation. Bolded lines indicate cortisol concentrations at the mean and at one standard deviation above (+1 SD) and below (−1 SD) the mean.

ICCs, which were in the "good" range (ICC for revealed thoughts =0.63; ICC for revealed feelings =0.64; ICC for revealed facts about oneself =0.61; Hallgren, 2012; McGraw & Wong, 1996). We averaged the ratings across the two coders (for each participant), and then averaged the three items (revealing thoughts, feelings, and facts) at each time point (αs from.93 to.96) to get an individual self-disclosure measure at each time point.

Although we collected three self-disclosure measurements per person and, thus, six self-disclosure measurements per dyad, because our outcome of interest is adrenocortical attunement (which has only one observation per dyad), we use one self-disclosure score per dyad as the predictor of adrenocortical attunement (Kenny et al., 2006; Snijders and Bosker, 2011). Given that there is often high reciprocity between dyad members in how much they disclose to one another (Collins and Miller, 1994; Dindia, 2000), this approach is not only necessary analytically but also reasonable theoretically. Indeed, we observed a high correlation between dyad members' self-disclosure ($r = 0.70$, $p < .001$), and the average difference between both dyad members' self-disclosure scores was low (given a 1–5 scale; $M = 0.34$, SD =0.30, $Min = 0.00$, Max = 1.22). Therefore, we averaged self-disclosure measurements per person across time points ($\alpha = 0.91$) and then across dyad members. This resulted in one self-disclosure measure per dyad which was approximately normally distributed ($M = 3.54$, $SD = 0.54$; total self-disclosure scores [one per dyad] = 68). Although dyadic data typically violate the assumption of non-independence, multilevel modeling (which can account for non-independence) was not necessary because there was only one outcome per dyad (Kenny et al., 2006).

3. Results

3.1. Primary analyses

First, we conducted a linear regression to predict self-disclosure during the conversation (one score per dyad) from question type (high self-disclosure coded as 1; low self-disclosure coded as −1). As expected, dyads who were assigned to ask each other high self-disclosure questions disclosed more ($M = 3.75$, $SD = 0.54$) than dyads who were assigned to ask each other low self-disclosure questions ($M = 3.35$, $SD = 0.47$), $b = 0.20$, $SE = 0.06$, $\beta = .37$, $t(66) = 3.26$, $p = .002$, 95% CI: 0.08–0.32.

Next, we conducted another linear regression to predict adrenocortical attunement (one score per dyad) from self-disclosure, while adjusting for question type. As predicted, we found that greater self-disclosure predicted greater adrenocortical attunement, $b = 0.04$, $SE = 0.02$, $\beta = 0.28$, $t(59) = 2.05$, $p = .045$, 95% CI: 0.001–0.08 (see Figs. 2 and 3).

Although there was no direct effect of question type on adrenocortical attunement, $b = -0.003$, $SE = 0.01$, $\beta = -0.04$, $t(59) = -0.27$, $p = .79$, 95% CI: − 0.02–0.02, we examined whether there was a significant indirect effect of question type on adrenocortical attunement via self-disclosure during the conversation. Using bootstrapping, the 95% confidence interval of the indirect effect of question type on adrenocortical attunement did not contain zero [.0003,.02], indicating that the mediation was significant at $\alpha = 0.05$. Thus, assigning new acquaintances to ask and answer questions which induced a high level of self-disclosure contributed to adrenocortical attunement via the self-disclosure that those questions elicited.

3.2. Sensitivity analyses

We conducted three sensitivity analyses to investigate the robustness of the relationship between self-disclosure and adrenocortical attunement (Thabane et al., 2013). All analyses adjusted for question type. First, we conducted an analysis with all cortisol data included (in contrast to our primary analysis, in which we marked cortisol values as missing if they were three or more standard deviations from the mean). The relationship between self-disclosure and adrenocortical attunement was consistent with that observed in our primary analysis with all cortisol data included, $b = 0.06$, $SE = 0.03$, $\beta = 0.27$, $t(64) = 2.06$, $p = .043$, 95% CI: 0.002–0.11.

Second, because we identified one dyad in our primary analysis which had a very low adrenocortical attunement score relative to the rest of our dataset (noticeable in Fig. 12), we conducted an analysis in which this data point was replaced with the second-lowest adrenocortical attunement value (i.e., it was winsorized; Gordis et al., 2006). The relationship between self-disclosure and adrenocortical attunement was consistent with that observed in our primary analysis with this data point winsorized, $b = 0.03$, $SE = 0.02$, $\beta = 0.27$, $t(59) = 1.97$, $p = .053$, 95% CI: − 0.0005–0.062.

Third, because individual cortisol responses change over the course of the day (Posener et al., 1996), we conducted an analysis adjusting for the average time since waking across the two members of the dyad (which itself was not a significant predictor of attunement: $b < 0.001$, $SE = 0.0001$, $\beta = 0.02$, $t(58) = 0.12$, $p = .91$, 95% CI: − 0.0002–0.0002). The relationship between self-disclosure and adrenocortical attunement was consistent with that observed in our primary analysis when adjusting for time since waking, $b = 0.04$, $SE = 0.02$, $\beta = 0.28$, $t(58) =$

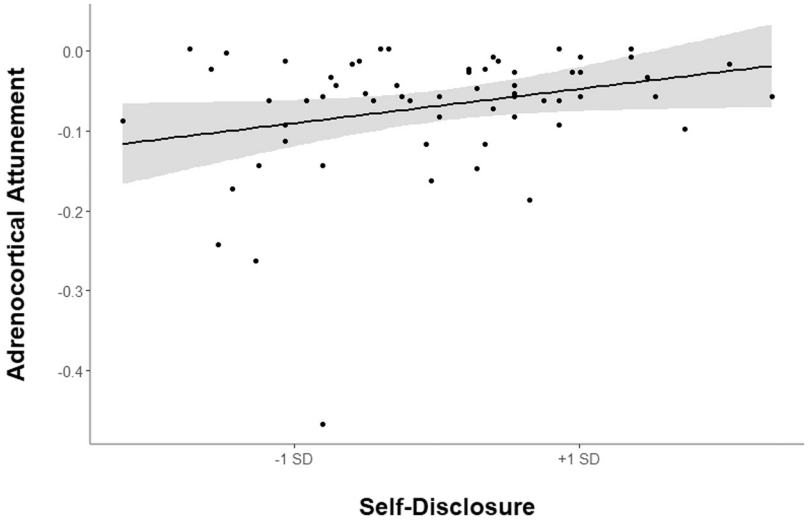

Fig. 2. Relationship between self-disclosure and adrenocortical attunement. The x-axis indicates predicted values at one standard deviation above and below the mean for self-disclosure. The gray band represents a 95% confidence interval around the regression line.

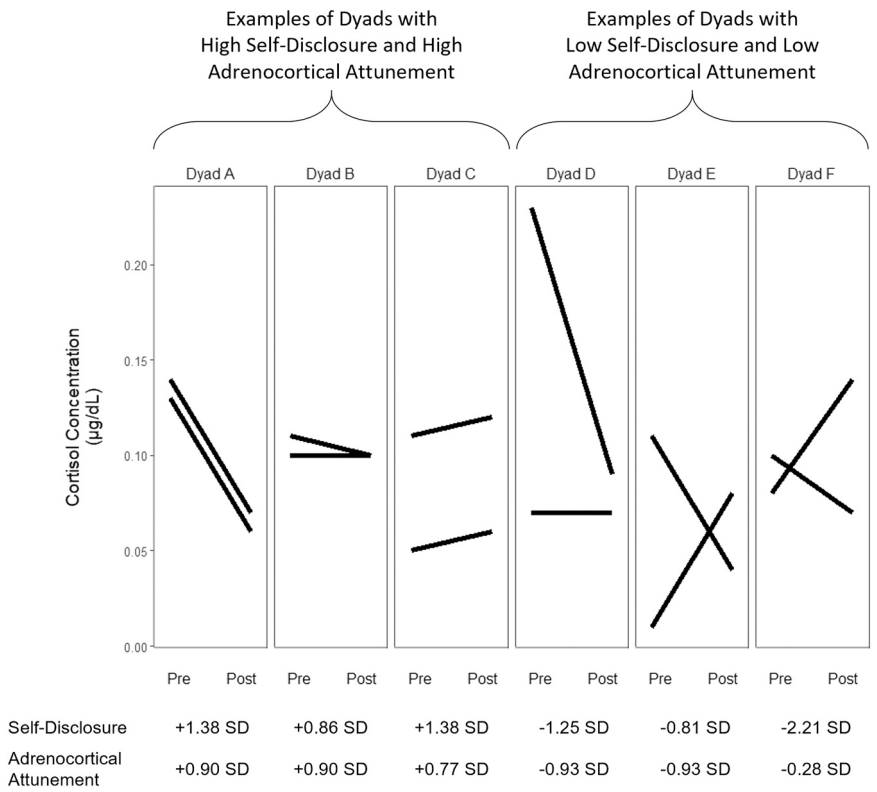

Fig. 3. Cortisol concentrations for six example dyads (three with high self-disclosure and high adrenocortical attunement and three with low self-disclosure and low adrenocortical attunement). Numbers at the bottom indicate self-disclosure and adrenocortical attunement values in terms of standard deviations (SDs) from the sample means.

1.99, $p = .051$, 95% CI: − 0.0002–0.08.

In sum, although the size of the relationship between self-disclosure and adrenocortical attunement varied slightly in size from analysis to analysis (βs ranging from 0.27 to 0.28), our three sensitivity analyses indicate that the relationship between self-disclosure and adrenocortical attunement is a robust one.

3.3. Ancillary analysis

One question our analyses raise is whether self-disclosure promotes adrenocortical attunement for all dyads by decreasing both dyad members' HPA axis activity, across all dyads. We tested this possibility by examining whether self-disclosure predicted individual cortisol change, adjusting for question type. Because the outcome variable was at the level of the individual, we used a model that treated the cortisol scores from two dyad members as repeated measures and adjusted for nonindependence between the two dyad members by correlating their errors (Kenny & Kashy, 2011). We found that self-disclosure did not predict individual cortisol change. This was true both with a model that used the dyadic self-disclosure score ($b = -0.002$, $SE = 0.01$, $t(50.29) = -0.16$, $p = .87$) as well as one using individual self-disclosure scores ($b = -0.01$, $SE = 0.01$, $t(69.74) = -1.14$, $p = .26$). Thus, we did not find support for the idea that self-disclosure leads to attunement by decreasing dyad members' HPA axis activity across the board.

4. Discussion

Does revealing more about oneself during a conversation with a new acquaintance predict greater similarity in cortisol changes with that person? We found that it does. When tasked with getting to know one another through a guided conversation, dyads who were assigned to ask and answer a set of questions designed to elicit high self-disclosure revealed more about themselves to each other than those assigned to ask and answer a set of questions designed to elicit low self-disclosure. In turn, dyads who revealed more about themselves experienced more similar cortisol changes in response to their conversation. To our knowledge, this is the first work to examine adrenocortical attunement among new acquaintances, a process which has been well-studied in longer-term, close relationships. The results suggest that, when people have just met and are trying to get to know one another, disclosure of thoughts, feelings, and information about oneself may be one social process through which interaction partners become synchronized in their HPA-axis activity.

The current research supports the idea that our hormonal responses can become regulated and shaped by the people with whom we interact—even those we have just met. Our work suggests that the process of self-disclosure, given its ties to HPA-axis reactivity, may also be one pathway through which interactions with new acquaintances influence health (Eisenberger and Cole, 2012). Future research might address whether newly-acquainted dyads become similar in HPA axis responding, via self-disclosure, in ways that are beneficial for long-term health, as well as when and for whom this happens. For example, adrenocortical attunement might be beneficial when new acquaintances both experience declines in (or stabilization of) HPA axis responses, instead of increases. We did not find evidence that self-disclosure promotes adrenocortical attunement for all dyads by decreasing both dyad members' HPA axis activity. Rather, for some dyads, self-disclosure may lead to similar decreases in HPA axis activity, and for other dyads, self-disclosure may lead to similar increases (or no changes) in HPA axis activity. One pathway through which self-disclosure may contribute to decreases in HPA axis activity is by promoting responsiveness and social support between partners (Karsay et al., 2019; Laurenceau et al., 2004; Zhang, 2017). Future research might address whether dyads for whom self-disclosure and responsiveness are tightly linked experience similar declines in HPA axis activity, which, if repeated across many interactions with new acquaintances, could be beneficial for people's

health in the long run.

We have proposed that self-disclosure is associated with adrenocortical attunement because it means people are providing their interaction partners with information about their current psychological experiences (i.e., they are acting as "expressive" targets; Funder, 2012). If their partners pay attention to this information, both dyad members may then have similar psychological experiences, which get reflected in similar physiological changes (Thorson et al., 2018). Future work on this topic might address whether self-disclosure leads to adrenocortical attunement via the processes we have proposed here—specifically, attentiveness between interaction partners and shared psychological experiences. For example, researchers might capture the process of attention between partners via visual attention or individual difference variables related to perceptivity of others. Shared experiences might be measured via participants' self-reports of their experiences—perhaps directly after the interaction or while watching a videotape of the interaction—or via outside observers' perceptions (Chen et al., 2020). One interesting possibility that this work raises is that people may not need to explicitly reveal information about their current psychological states for adrenocortical attunement to occur. Instead, it may be that disclosing any thought, feeling, or fact from any time in one's life causes people's partners to pay more attention to them in general. This increase in general attention may allow people to gain more information about their partners' current psychological states, thereby potentiating attunement in current physiological responses.

Several studies have suggested that adrenocortical attunement is particularly likely to occur when one or both members of a dyad experience distress or a lack of support (Ha et al., 2016; Hibel and Mercado, 2019; Liu, Rovine, Klein et al., 2013; Pratt et al., 2017; Rankin et al., 2018; Saxbe and Repetti, 2010). These findings may seem at odds with our current results, given that the conversations we studied here and the disclosure that occurred during them was not necessarily distressing. However, these past findings emerged in studies of close relationships, in contrast to our study here of newly-acquainted people. One possibility is that the most noticeable behaviors from partners in close relationships are ones indicating distress, and, therefore, these are the behaviors that potentiate physiological synchrony between partners. In contrast, in the early stages of relationship formation, when people are forming first impressions and gathering the most information about each other (Borkenau et al., 2004; Brown and Bernieri, 2017; Wiedenroth and Leising, 2020), interaction partners may attend closely to any revealing information, potentially due to the novelty of the interaction. In new relationships, then, behavioral cues that reveal something about a person, rather than behaviors that communicate distress, may be the ones most likely to contribute to adrenocortical attunement. Future research might consider how relationship stage influences which behaviors are most likely to predict adrenocortical attunement and whether the influence of self-disclosure on adrenocortical attunement declines over time.

Several strengths of this study are worth noting. One, we studied adrenocortical attunement during face-to-face social interactions, which is important given that most interactions—especially with new acquaintances—occur in face-to-face settings. Two, we used a measure of self-disclosure that was based on participants' actual behaviors (as judged by outside coders) and not based on participants' reports of disclosure, which could be biased by self-presentational concerns or retrospective biases. And, three, participants in this study varied in terms of their race (about one third of participants identified as White, one quarter as Asian, and about 15% each as Latinx and as Black), increasing generalizability of these results beyond just one racial or ethnic group.

4.1. Limitations and future directions

We studied pairs of new acquaintances who were not meaningfully different from one another (in contrast to other relationships, where dyad members can be distinguished from each other on theoretically meaningful variables—for example, husband-wife and parent-child combinations). This focus on indistinguishable, new acquaintances means that we were limited in having one measure of attunement per dyad, and, therefore, only one combined measure of disclosure for the dyad as well. To better understand the nuances of how self-disclosure is associated with adrenocortical attunement, future work might consider assigning partners to roles—for example, where one person discloses during the conversation and the other partner listens (Sprecher et al., 2013). This would allow for isolating how the act of disclosing versus the act of listening to another person is associated with becoming more similar to another partner in cortisol change, which would be interesting from a theoretical perspective. That being said, because reciprocity in self-disclosure during unstructured interactions is typically quite high (Collins and Miller, 1994; Dindia, 2000), from a practical standpoint, it is unlikely that the two processes ever operate completely separately in real interactions.

Here, we measured adrenocortical attunement as the extent to which both dyad members experienced similar cortisol changes in response to an initial guided conversation with each other, and we did this by comparing pre- to post-conversation levels of cortisol. Future work might consider measuring cortisol more frequently throughout the guided conversations to more precisely model how adrenocortical attunement unfolds over time. In addition, future work might also consider whether new acquaintances experience similarity in cortisol responses that are measured throughout the day or as new acquaintances recover from shared stressors (Hibel et al., 2015; Liu et al., 2013; Papp et al., 2009, 2013; Rankin et al., 2018; Saxbe et al., 2015; Saxbe and Repetti, 2010). Although it seems unlikely that new acquaintances would experience similar cortisol responses throughout the day (relative to married partners and family members), it is possible that similarity in responding could exist if the acquaintances were in each other's presence across the day (e.g., as might happen for new coworkers). New acquaintances might also experience similar cortisol responses as they recover from shared stressors if they have access to information from each other or are still thinking about each other as they recover. All these approaches, assuming they involve sampling cortisol multiple times, would also allow for measuring adrenocortical attunement as the extent to which one partner's cortisol level at one time point influenced the other partner's cortisol level at a later time point (e.g., using the stability and influence model outlined by Thorson et al., 2018). This analytic approach would be useful in that it could reveal whether there are meaningful differences in which dyad member "influences" the cortisol change experienced by the other dyad member at a later time point. In sum, collecting more measurements of new acquaintances' cortisol would be a useful next step for understanding more about when, for how long, and how new acquaintances experience similar HPA axis activity.

In addition, an important question is what the relationship of adrenocortical attunement is to people's subjective experiences of their interactions with new acquaintances. For example, do people enjoy interactions with new acquaintances more if they experience more adrenocortical attunement? As other research has demonstrated and as we report in the supplement, adrenocortical attunement and other measures of physiological correspondence are neither uniformly good nor bad for relationships (Danyluck and Page-Gould, 2019; Timmons et al., 2015). To the extent that adrenocortical attunement occurs because of the mechanisms we have theorized about here—that is, when people provide information about themselves that is paid attention to by their interaction partners—it could occur within interactions that people perceive as positive or negative. For example, interactions focused on the disclosure of distressing personal information might be less enjoyable than those that focus on the disclosure of positive personal information, even though both interactions might be associated with attunement. One possibility is that the type of attunement (i.e., similarity in how much cortisol increases, decreases, or stays the same)

predicts the valence of people's feelings post-interaction. Although we do not have the statistical power to examine that question here, future research might consider how attunement type or other features of a conversation shape the association between attunement and subjective experiences of interactions and relationships.

Finally, dyad members in this study were fairly similar to each other (although likely less similar to each other than dyads in most work on adrenocortical attunement, which has examined close relationship partners). All participants lived in the same metropolitan area, and most of the dyads (74.2%) were composed of two current university students. Although this is similar to real life in that people are likely to interact with those who are similar to them in terms of life experiences, environment, and personality (McPherson et al., 2001), it is possible that different effects might emerge for dyad members who are less similar to each other. For example, dyad members from more dissimilar backgrounds may have trouble communicating with each other due to language differences or cultural norms, and they may also disclose information that is confusing to one another, given different life experiences. In these situations, dyad members are likely to be less accurately perceived, and this could lead to less adrenocortical attunement. Future work might consider these possibilities and examine how adrenocortical attunement unfolds for new acquaintances who are more dissimilar to one another than the dyads here.

4.2. Conclusion

The current study demonstrated, for the first time, that self-disclosure during a guided conversation between new acquaintances is associated with similarity in cortisol responses to that conversation. In other words, dyads who revealed more about themselves experienced similar cortisol changes in response to their conversation. This work documents one social process through which adrenocortical attunement occurs during early relationship formation and, in doing so, reveals a new process through which our physiological functioning can become tied to those around us—even those we have just met.

Author Note

Study materials, data, and analysis syntax are available at https://osf.io/j4g29/https://osf.io/j4g29/?view_only= 7c7289818a2c48c7b5ebb9e75ba752d6

Conflict of Interest

The authors have no conflicts of interest to declare.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.psyneuen.2021.105323.

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