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Sexual Synchrony During Partnered Sex

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ABSTRACT

There is growing interest in understanding how sexual arousal unfolds between partners, and how this may change over the course of a relationship and in the face of sexual distress. To capture the variable, dynamic, and dyadic nature of sexual responding, this paper introduces the concept of sexual synchrony, defined as the temporal, reciprocal, and coordinated interchange between partners' subjective and genital sexual arousal. Sexual synchrony is a key mechanism for understanding how partners experience and adapt their sexual arousal responses as they evolve over time. Its relevance lies in examining the mechanisms that may disrupt and facilitate synchrony and exploring how it may contribute to sexual well-being by enabling partners to mutually regulate their sexual arousal within and across sexual interactions. The paper also discusses how sexual synchrony may evolve throughout relationship development and its potential role in sexual problems, offering valuable insights into improving sexual relationships. Suggestions are provided for future research, together with a discussion of the methodological and statistical issues involved when examining sexual dynamics. Understanding how partners jointly regulate their sexual responses allows the development of dyadic models of sexual arousal which will inform treatments for improving couples' (sexual) well-being. The study of sexual synchrony also exemplifies the importance of translational research that is relevant across disciplinary borders.

Introducing Sexual Synchrony

Over the past decades, several fields of research, including emotion, cognition, physiology, and neuroscience, have transitioned from studying intra-individual processes to inter-individual processes and real-time interactions among two (or more) individuals (Butler & Randall, 2013; Mayo & Gordon, 2020; Palumbo et al., 2017; Pan et al., 2022). Sex research has witnessed a similar shift, recognizing the largely interpersonal and dynamic nature of sexual responding (Dewitte, 2014; Rosen et al., 2019). It is unfortunate that, despite an overlapping interest, these different fields have developed in isolation. While research on interdependent processes in dyads is vastly growing, sex research is lagging behind even though there is no other human interaction in which coordinated changes in movement, physiology, and emotion is more relevant than when people have sex. Recent accounts have acknowledged that sexual responses involve interdependent processes (Dewitte, 2014, Kim et al., 2021; Muise et al., 2018; Rosen et al., 2019), but we still lack a clear understanding of the interpersonal, malleable, and variable nature of sexual arousal patterns as they unfold during sexual interactions, across different contexts, in response to sexual distress, and over time. In order to push the field forward, it is imperative to move beyond conventional, stationary designs and rely on moment-to-moment tracking of both subjective and physiological arousal responses during real-life sexual interactions between partners.

Inspired by recent advances in emotion and relationship research on dynamic system models and interdependent processes (Butler & Randall, 2013, Coutinho et al., 2019; 2021), the concept of "sexual synchrony" is proposed as a valuable framework for understanding why some couples (learn to) align their sexual arousal responses while others fail to do so, and why sexual problems in one partner are so commonly associated with sexual problems in the other partner. Providing a straightforward definition of sexual synchrony is challenging because definitions vary across disciplines and literatures, highlighting different features and functions of synchrony, depending on their specific focus and angle. Furthermore, different labels are used to describe interpersonal covariation between emotional and biobehavioral parameters. Some of these include synchrony, interpersonal coordination, linkage, attunement, contagion, transmission, and coregulation. Although these different terms tap into a similar process, they do need to be differentiated from each other as they refer to potentially distinct phenomena and represent slightly different dynamics (Butler, 2011). This paper adopts the broad term synchrony, which may encompass multiple processes of interconnection between partners. The specific processes of contagion, transmission, and coregulation will be explained below.

Sexual synchrony is here defined as the temporal, reciprocal, and coordinated interchange between partners' subjective and genital sexual arousal responses. Gaining deeper insight into the moment-to-moment coordination between partners' sexual arousal responses will enable us to tackle a number of long-standing, fundamental questions on sexual interdependence.

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Concretely, exploring whether partners synchronize their subjective and genital arousal toward each other during sex will inform us about whether and how this process enhances or impairs the sexual experience. Moreover, investigating whether these dynamics change over the course of a relationship and during sexual problems and/or distress may provide valuable theoretical and clinical insights. Knowledge on couple-level processes during sex is essential for developing dyadic models of sexual arousal that more accurately reflect the reality that sex often takes place within interactions where partners mutually influence each other's responses (Dewitte, 2014).

Before elaborating on the definition, underlying mechanisms, and implications of sexual synchrony, (sexual) relationships are conceptualized as dynamic systems that become coupled over time. This perspective helps in understanding why and how couples align their physical, cognitive, and emotional states and how this alignment may apply to sexual interactions (Butler & Randall, 2013). The most relevant ideas on interpersonal synchrony are reviewed to highlight their heuristic and empirical value and their potential to explain how couples' sexual responses interact and evolve over time. This paper does not provide a scoping or systematic review of the literature on (interpersonal) synchrony but presents a critical review to highlight the most relevant insights for understanding the value of sexual synchrony. A literature search on Web of Science and PubMed was conducted, which developed iteratively and included the following terms: dynamic systems and relationships, interpersonal synchrony, physiological synchrony, emotional synchrony, behavioral synchrony, coregulation, attunement, linkage, and (emotional) interdependence.

Relationships as Dynamic Systems Founded in Interpersonal Synchrony

According to dynamic system models, individuals are self-organizing systems that become interconnected through social interactions, forming dynamic relational systems that continuously influence each other (Butler, 2011; Cox & Paley, 1997; Palumbo et al., 2017; Timmons et al., 2015). This interconnection runs through feedback loops that involve synchrony-related processes, leading to coordination of actions, emotions, thoughts, and physiological responses within and between individuals (Ackerman & Bargh, 2010). This so-called "interpersonal synchrony" is assumed to arise spontaneously when individuals interact because one person's physiological, emotional, and behavioral reactions directly trigger and become coupled with similar physiological, emotional, and behavioral reactions in the person one interacts with (Ayache et al., 2021; Hatfield et al., 1994). Accordingly, relationship partners create an interdependent system that responds to both internal and external stimuli, and is directed toward regulating emotions, maintaining homeostatic balance, and minimizing negative consequences for the system (e.g., Butler, 2011).

Ample research has shown that people automatically mimic facial expressions, vocalizations, and postures when they interact with another person, which leads both individuals to experience similar emotions or regulate each other's emotions to achieve a shared steady state (Barsade, 2002; Hatfield et al., 1994). The magnitude of this synchronization process seems to increase with the level of closeness or intimacy between interacting individuals, meaning that synchrony develops as a function of, but also contributes to, interpersonal closeness (Butler & Randall, 2013). Synchrony can thus be considered a key concept in relationship research because it serves as a basic intimacy-promoting strategy needed for both relationship initiation and development. Applied to romantic relationships, there is a large body of evidence showing that partners spontaneously match their responses across various physiological (e.g., heart rate, skin conductance, cortisol, brain), emotional, and behavioral responses, in both new and established relationships, and across a range of contexts (i.e., laboratory, naturalistic settings) (see Timmons et al., 2015 for a review).

From Interpersonal Synchrony to Sexual Synchrony

Although it is intuitive that partners also synchronize various response systems during sex, such as breathing, heart rate, gazing, touch, and behavioral movements, to build (mutual) sexual pleasure (Pfaus et al., 2023), there is little research to demonstrate this. Recent work has expanded the growing body of literature on interpersonal synchrony into the domain of sexuality. While Pfaus et al. (2023) provided a theoretical analysis of (mainly) behavioral and brain synchrony during attraction, courtship, and sexual intimacy, Freihart and Meston (2024) focused specifically on physiological synchrony during sexual interactions. In a sample of 58 mixed-sex couples, they found that synchronization occurs at the level of autonomic responses, indicating that partners modulate their own heart rate to match the cues of their partner during sexual interactions and that physiological synchrony is linked with higher sexual satisfaction (Freihart & Meston, 2024). Using a series of tasks that built up from non-sexual (gazing, mirroring, handholding) to sexual (foreplay, prescribed sexual positions, and free sexual interplay), they found that heart rate synchrony increased as sexual interactions became more sexually intimate. Further exploration is needed to determine if synchrony also occurs at the level of sex-specific responses, i.e., subjective feelings of sexual arousal and genital arousal (i.e., blood flow, vaginal lubrication, erection), and how this generalizes to the overall relationship. A first study in a sample of 36 mixed-sex couples has revealed that partners show synchrony in subjective and genital arousal responses while sexually stimulating each other in a laboratory context and that subjective arousal synchrony during the sexual interaction was associated with higher levels of sexual satisfaction (Pawlowska et al., 2024; manuscript submitted for publication). Other studies focusing on daily measurements of subjective sexual arousal at home has shown that partners exhibit synchronous patterns of self-reported sexual desire and perceived sexual arousal across a study period of 3 to 4 weeks (Pawłowska, Janssen, et al., 2023; Pawłowska, Loeys, et al., 2023; Vowels et al., 2018).

Notwithstanding the importance of these first theoretical and empirical explorations, the question remains whether *sexual* synchrony is distinct from, or overlapping with interpersonal synchrony. One could argue that sexual synchrony is a specific manifestation of interpersonal synchrony since it encompasses the temporal coordination of both physiological responses

(genital arousal) and emotional responses (subjective sexual arousal). To address this matter, it is relevant to explore whether sexual synchrony can be differentiated from and operate together with general markers of interpersonal synchrony between partners during sex. While differing in their focus, sexual and nonsexual forms of synchrony will likely interact when generating sexual excitement, each making a unique contribution to sexual and relational well-being. Analyzing synchrony at multiple levels during sexual interactions could uncover potential pathways through which synchronization occurs and enhances (mutual) sexual pleasure.

From Physiological Synchrony in Parent-Child Relationships to Sexual Synchrony in Partner Relationships

Although various types of synchrony in relationships exist, physiological synchrony has attracted the most research attention due to its key role in human development and overall health (Feldman, 2017; Palumbo et al., 2017). From birth, children mirror the signals they observe in their primary caregivers (Feldman, 2012). This helps them to coordinate their attention, emotions, and behaviors, which is essential to develop regulatory skills and attune to their (social) environment (Atzil & Gendron, 2017; DePasquale, 2020; Feldman, 2017).

As children cannot yet independently regulate their own emotional and physiological balance, they incorporate cues from their caregiver into their psychobiological system (Atzil & Gendron, 2017; Feldman, 2012). Attunement with a responsive attachment figure provides a "homeostatic set point" and a secure base for children to develop self-regulation skills. Consequently, self-regulation depends on coregulation between parent and child, a dynamic that persists across the lifespan (Diamond, 2003; Feldman, 2006; Sbarra & Hazan, 2008; Zaki & Williams, 2013). This secure base helps children build trust in oneself and others, facilitates exploratory behavior, and moderates the tendency to mirror social bonds throughout life (Feldman,2012, 2017; Riess, 2017; Sbarra & Hazan, 2008). Therefore, biobehavioral synchrony in the parent-child bond provides a template for coregulation between romantic partners later in life. Recent theories confirm that coregulation of physiological and behavioral signals is crucial to initiating romantic relationships and improving engagement between partners, suggesting that synchrony can serve similar coregulatory functions in adults (Zeevi et al., 2022).

There is a delicate balance between coregulation and self-regulation in adult romantic relationships, and, as explained above, both tendencies have their roots in early parent-child relationships (Zaki & Williams, 2013). According to social baseline theory, a stable couple relationship offers security, helping partners maintain optimal mental and physical states with less effort than if they relied only on their own self-regulation (Beckes & Coan, 2011; Coan & Sbarra, 2015). Being in sync is a rapid and effective way to "get on the same page" and to use the partner as an automatic and fast way to regulate psychological and biological demands. As a result, energy is conserved, enabling individuals to engage more flexibly with their environment, including their relational dynamics (Beckes & Coan, 2011; Coan & Sbarra, 2015; Coan et al., 2006).

It makes intuitive sense that sexual synchrony serves similar adaptive functions and helps partners to balance their individual and couple sexual functioning. Over time, repeated sexual synchrony may establish a new homeostasis – a stable state within the relationship – that acts as a reference point for regulating each partner's sexual functioning. This can be understood through the lens of sexual scripts. When partners engage in sexual activities together, they create a unique sexual script that includes the acts they enjoy, their preferences, and the dynamics of their relationship. This script relies on synchrony-related processes where partners align their sexual responses, evolving as couples explore and discover what works best for them. Individual arousal levels can fluctuate within the context of this script. Each partner may have their own triggers, preferences, and responses to stimuli, which can influence their arousal levels during sexual encounters. Over time, couples often establish a sort of "set-point" for arousal within their relationship, shaped by the gradual synchronization of their desires, preferences, and communication about what brings them pleasure. This set-point can serve as a guide for their sexual interactions and help them navigate intimacy together.

Parameters and Patterns of Synchrony

To fully capture the empirical significance of sexual synchrony, we must understand its parameters and underlying mechanisms. Since sexual synchrony is a new concept without a dedicated evidence base, we must begin by considering what is understood about interpersonal synchrony and examining its potential relevance to sexual synchrony.

Three main aspects characterize interpersonal synchrony, i.e., time matching of responses, comparability of responses, and dynamic interaction between individuals (e.g., Ackerman & Bargh, 2010; Butler, 2011; Feldman, 2012; Hove, 2008). In addition, there are several key parameters to consider when assessing synchrony (see Palumbo et al., 2017 for an overview). First, the magnitude of synchrony, which refers to the strength of the association between partners' responses. A second important parameter is the sign of synchrony, indicating whether partners' responses covary in the same or opposite direction. Concordance, in phase, or positive synchrony reflects emotional contagion and simple reactivity, whereby partners mirror each other's responses. This means that an increase or decrease in one partner's response is followed by, respectively, an increase or a decrease in the corresponding response of the other partner (e.g., the joint experience of negative emotions during conflict escalation). Disconcordance, antiphase, or negative synchrony means that partners' responses covary across time in opposite directions, such that an increase in one partner's response is associated with a decrease in the corresponding response of the other partner (e.g., one partner dampening the negative emotions of the other partner during conflict). Hence, negative synchrony is linked to co-regulation, whereby one of the partners may (temporarily) increase or decrease their responses to accommodate the needs of the other partner and regulate their emotions (Butler & Randall,

2013; Coutinho et al., 2021). An example of positive synchrony or contagion in a sexual encounter is when one partner's heightened arousal spills over to the other partner's level of arousal. Hence, if one partner becomes very passionate, their excitement can be contagious, leading the other partner to also become more engaged. Negative synchrony of coregulation in a sexual encounter would imply that partners continually adapt their responses based on each other's needs and feedback throughout the encounter. Accordingly, if one partner begins to slow their movements or change their touch based on the other partner's reactions, the other partner might reciprocate by adjusting their own responses accordingly.

A third parameter is the direction of synchrony, referring to which partner's signal predicts the other partner's signal and whether this remains consistent during and across interaction(s). If one partner simply follows the other partner, this may point toward attunement or contagion, but when one partner "pulls" the other partner into a more adaptive response, this may indicate coregulation. There is initial evidence that these processes occur in sexual encounters. Freihart and Meston (2024) have shown that heart rate synchrony during sexual interactions follows a time-lagged pattern in which the female partner's heart rate signals predicted the male signals during a free sex play condition (i.e., penetrative sexual activity in a position and timing of choice) while men drove the interaction during foreplay (i.e., intimate touch apart from penetrative sex). Hence, the specific pattern of whom drives whom may not only change between dyads but also within dyads and during the sexual interaction. Although, at first sight, it may not seem to matter for the sexual experience who drives the sexual interaction and who follows, this may become pertinent when facing sexual problems.

Based on these parameters, we can plot the exact pattern of synchrony across a sequence of responses to determine if the responses oscillate around a stable (morphostatic) or changing (morphogenic) state (Butler & Randall, 2013). This involves investigating whether the responses (1) are changing in a linear way (e.g., continuously increasing or decreasing); (2) are oscillating (e.g., alternating between increasing and decreasing); (3) are returning toward a steady state (damping); or (4) are moving away from it (amplification); (5) are in-phase (changing in the same direction) or anti-phase (changing in opposite directions); (6) are predicting each other; and (7) are converging toward a shared homeostatic state or a change of state.

Underlying Mechanisms of Sexual Synchrony

Cognitive-Emotional Mechanisms of Interpersonal Synchrony

To intervene effectively, we must gain deeper insight into the processes that may facilitate or disrupt synchrony. Understanding the biopsychosocial mechanisms underlying sexual synchrony is essential for exploring its implications in either enhancing or disrupting sexual experiences between partners, which is, ultimately, the core value of the concept of sexual synchrony. Drawing from the literature on interpersonal synchrony, several key mechanisms can be identified that are likely relevant to sexual synchrony.

Perceived similarity, shared attention, shared goals, and empathy are commonly cited as the primary factors explaining synchrony across various contexts. Having the same experience at the same time may foster the perception of similarity and self-other blurring, thereby inducing a sense of oneness and joint identity, which fulfills partners' inherent need for closeness (Hove, 2008; Mogan et al., 2017). In addition, cognitive processes such as (shared) attention facilitate interpersonal synchrony. People have a natural tendency to show attentional biases toward synchronous partners (Macrae et al., 2008). When people interact, each person's response can modify the other person's focus of attention so that the responses of both people become coordinated by simply picking up each other's signals. This shared allocation of attention allows partners to translate their subjective feeling of cohesion into joint action (Rennung & Göritz, 2016). Shared attention and goals are known to boost partner connectedness (Toma et al., 2022). Furthermore, it has been suggested that synchrony relies on empathy and interpersonal understanding, although it is unclear whether these processes drive or result from synchrony between partners' responses (Chatel-Goldman et al., 2014; Levy & Feldman, 2019; Nelson et al., 2017; Reuf, 2001). In addition to cognitive-emotional mechanisms, research has also shown that physical proximity and time spent together during the day as well as touch and vocal conversations may facilitate synchrony between people's emotional and physical responses (Schoebi, 2008).

Cognitive-Emotional Mechanisms of Sexual Synchrony

All of the abovementioned processes – i.e., perceived similarity, shared attention, shared goals and empathy – have been found to play a role during partnered sex. The desire to become one with the partner is a viable motive to engage in sex (Birnbaum et al., 2006). It is also plausible that empathy-related processes, such as being responsive to one's partner's sexual needs and the ability to infer the internal state of the partner, are involved in sexual synchrony, driving partners to modulate their own sexual arousal responses to match the cues they get from the other (Levy & Feldman 2019). That sexual synchrony depends on attentional processes is evident given the large literature demonstrating the prominent role of attention in sexual arousal (Barlow, 1986; Tavares et al., 2020). Engaging and maintaining attention to sexual cues, whether these stem from oneself or the partner, is integral to the onset and regulation of sexual arousal (Barlow, 1986; Milani et al., 2021). Interoceptive awareness could serve as a key mechanism in this process by heightening sensitivity to physiological changes associated with arousal, such as increased heart rate, breathing patterns, and genital sensations (Handy & Meston, 2016). Tuning into these bodily signals may improve the capacity to identify and react to arousal cues from oneself and the partner, thereby amplifying the (subjective) experience of sexual synchrony. While interoceptive awareness of one's own arousal might improve sexual synchrony, it may also interfere with sexual arousal when driven by perceived expectations of the partner or a focus on meeting certain standards (i.e., performance demand) (Critchley & Garfinkel, 2017; Handy & Meston, 2016; Masters & Johnson, 1970).

Another potential mechanism through which sexual synchrony may enhance the sexual experience is the subjective perception of being in sync. There is evidence suggesting that perceiving interpersonal synchrony is important for experiencing its effects (e.g., Bente & Novotny, 2020; Koehne et al., 2016; Llobera et al., 2016). It could be relevant to investigate whether partners can recognize and report signs of synchrony between their sexual arousal responses. Understanding whether the perception of being in sync matches and contributes to actual synchronization of responses could reveal how couples' awareness of their mutual arousal states affects their sexual experience and connection.

When reflecting on these underlying mechanisms, it raises the question whether different types of synchrony exist, differentiating between automatic and strategic forms of sexual synchrony. That is, synchrony may occur spontaneously, without conscious effort and control, or it may require an explicit goal or intention to adjust to each other's responses. In a sexual scenario, one or both partners may intentionally adjust and regulate their responses to match their partner's needs, either slowing down or speeding up arousal to synchronize with their partner's pace or allow the partner to catch up. This deliberate adjustment differs from spontaneous forms of contagion, where the sexual arousal signals of one partner are transmitted to the other partner in a fairly automatic way. It remains to be tested whether partners can actively adjust their physiology as a technique to engage the other or influence closeness. Thus far, the evidence has shown that synchrony is not simply a by-product of partners' shared environments and experiences, but an active, seemingly spontaneous, outgrowth of social interactions. In support of this, an experience sampling study has shown that partners' level of positive and negative affect – as reported six times a day for seven days – covaried above and beyond the influence of their shared daily interactions (Schoebi, 2008). Specific to sexual responding, Freihart and Meston (2024), who measured heart rate synchrony between partners during sexual and non-sexual situations, found that a lagged model provided a better fit to the data than a simple covariation model. This indicates that partners actively incorporate each other's cues into their own automatic nervous system and do not simply react to a shared environment.

Hormonal Mechanisms of Interpersonal and Sexual Synchrony

Research on interpersonal synchrony suggests that partners synchronize their hormonal secretion through coordinated behavior (Djalovski et al., 2021; Schneiderman et al., 2014) with oxytocin, testosterone, and cortisol frequently cited in this context. These are key hormones implicated in social bonding and stress regulation, which are also released during sexual contact and facilitate biobehavioral synchrony (Meyer & Sledge, 2020; Pfaus et al., 2023; Saxbe & Repetti, 2010). Oxytocin, known for its role in attachment and pair bonding, may mediate synchronization between partners through activation of mirror neurons and mentalizing networks (Carter, 2022; Feldman, 2017). Cortisol levels between partners also covary, reflecting the quality of their relationship (Saxbe & Repetti, 2010). While dopamine is less studied in the context of synchrony, its role in reward processing suggests it could contribute to the pleasurable aspects of sexual synchrony (Brom et al., 2014). Sexual interactions – including cuddling and genital stimulation – activate oxytocin, opioid, and dopamine systems, which will enhance pleasure and emotional balance for both partners (Dewitte, 2012; Feldman, 2017; Sbarra & Hazan, 2008). This biobehavioral synchrony reinforces emotional connection and helps maintain homeostasis within the couple's relationship.

The Adaptive or Maladaptive Value of (Sexual) Synchrony and Its Development Over Time

This section offers a brief overview of how interpersonal synchrony influences relationship development and quality, highlighting its potential to shape (sexual) relationships. It draws on the extensive literature on interpersonal synchrony, discussing key insights and debates, and then extends these findings to explore sexual synchrony within romantic relationships.

When and How Much Interpersonal Synchrony is Adaptive for the Relationship?

Given that coordination with a significant other serves important functions for developing attachment bonds, it seems intuitive to associate interpersonal synchrony with positive outcomes (Feldman, 2017). There is indeed ample evidence to support that people who synchronize their responses show increased prosocial behavior, emotional connectedness, empathy, positive affect, and positive self-evaluations (for overviews, see Hu et al., 2022; Palumbo et al., 2017; Timmons et al., 2015). However, synchrony can also have negative effects, like spreading negative emotions during stress or reducing self-regulation by overly relying on the partner. Accordingly, it has been suggested that synchrony is not inherently adaptive or maladaptive, but that the implications of synchrony depend on the context and the response system that is measured (Helm et al., 2014, 2018). The question is thus not *if* synchrony is adaptive but *when* and *in what context* it is adaptive for relationship functioning. There are many examples to illustrate that the relational implications of synchrony are not straightforward. While synchrony during conflict can escalate stress and anger, it can also promote empathy and emotion regulation if one partner's decrease in anger helps the other to calm down. Similarly, synchrony can enhance feelings of empathy and closeness when sharing vulnerabilities, but it can also entrench couples in a depressive cycle (Timmons et al., 2015).

The context-dependence of synchrony-related effects on the relationship becomes particularly evident when considering its physiological basis (for overviews, see Palumbo et al., 2017; Timmons et al., 2015). Synchrony in sympathetic nervous system (SNS) activation, linked to arousal and stress responses, often occurs during conflict and may indicate poor relationship functioning. In contrast, co-activation of the parasympathetic nervous system (PNS), which is linked to relaxation and positive emotions, tends to occur in positive contexts. It helps with stress buffering, reduces negative emotions, and promotes empathy,

relationship satisfaction, and mutual emotional regulation. Synchrony in cortisol responses, on the other hand, can lead to increased arousal and distress, associated with relationship dissatisfaction and destructive demand-withdrawal patterns of communication (Reed et al., 2013). Given that (genital) sexual arousal involves both SNS- and PNS-related processes and can be modulated by HPA-activation (Meston, 2000, Stanton et al., 2019), examining physiological synchrony across various sexual interactions and contexts could provide further insights into the role of synchrony-related processes in sexual and relational well-being.

Determining not only *in what context* synchrony is adaptive for relational functioning but also *to what extent* it is beneficial is a topic open to discussion. Partners should seek a level of synchrony that is "just right" to support self- and interpersonal regulation. Yet, it is not clear what constitutes the optimal level of synchrony. Interpersonal synchrony is suggested to follow a curvilinear pattern: low synchrony is linked to low relationship adjustment, moderate synchrony to high adjustment, and high synchrony to low adjustment (Timmons et al., 2015). Too much synchrony may interfere with adaptive-self-regulation, but too little synchrony may indicate a lack of connection, couple burnout, or disengagement. Given the ambiguity regarding the exact required level of synchrony, it may prove more adaptive to flexibly move in and out of synchrony rather than striving toward the optimal level of synchrony (Feldman, 2017; Mayo & Gordon, 2020). Such flexibility can shield couples from getting trapped in repetitive patterns of enmeshment, which may hinder their ability to maintain a sense of individuality and differentiation from each other (Kovacs, 1995; Muise & Goss, 2024). An adaptive interpersonal system demonstrates flexibility, in which the tendency to synchronize with the partner coexists with the tendency to move out of synchrony and act independently in order to adjust to relational demands (Mayo & Gordon, 2020).

Another demonstration of couple flexibility is when levels of synchrony fluctuate rather than staying constant over time (Butler, 2011, 2022). Partners in close relationships often mirror each other's emotions automatically, establishing a unique emotional balance that supports co-regulation (Byers, 2005; Gottman et al., 1977; Guéguen, 2009; Hatfield et al., 1994; Lavner & Clark, 2017). However, during challenges such as individual changes or external stressors, couples will adjust their dynamics to establish a new homeostasis that supports each partner's individual functioning and well-being. By flexibly transitioning in and out of synchrony, the couple can navigate challenges while maintaining a balanced relationship dynamic (Butler, 2022). An important implication of this need for flexibility is that the value of synchrony – whether, when, and to what extent – depends on the stage of the relationship.

How Does Sexual Synchrony Impact Relational and Sexual Well-Being and Evolve Over Time?

Now applying this to sexual synchrony, it is relevant to examine *in what context* and *to what extent* synchrony facilitates self- and interpersonal regulation across sexual interactions. Too much synchrony with the partner might limit individual expression and spontaneity, while too little or asynchronous patterns of sexual arousal may lead partners to feel detached. Not only is it unrealistic to expect perfect synchrony, it is also not necessarily advantageous, especially *within a sexual interaction*. Tuning in with the partner may be adaptive during the arousal stage where it may facilitate sexual excitement and fuel sexual pleasure, but it may also distract partners from keeping focus on their own sexual experience, thereby hindering or delaying orgasm. This indicates the importance of identifying critical thresholds at which synchrony will facilitate or disrupt the transition from arousal to orgasm. The function of synchrony may change over the course of the sexual response cycle, whereby a satisfying sexual experience may require partners to *flexibly move in and out of synchrony* with each other. This implies that synchrony in itself may be a poor indicator of sexual and relationship quality and must be understood within the overall sexual and relational context (see Butler, 2011). In light of this, one might question whether trying to synchronize would benefit the sexual experience more than simply accepting that one partner has higher arousal than the other during one or multiple sexual interactions.

The pattern and function of synchrony may not only change within a sexual interaction but also *across interactions*, varying along the stage and quality of the (sexual) relationship. As explained previously, sexual synchrony can take different forms, i.e., contagion versus coregulation, that may shift or interact during relationship development. More concretely, the emotional responses of one partner can spill over or transmit to the other partner via simple reactivity and contagion, implying that partners' responses will rise and fall together (Hatfield et al., 1994). Synchrony can also involve coregulation which means that an increase in one partner's response is complemented or counterbalanced by a decrease in the other's response as a way to match the partner's needs or to reach a shared state of arousal (Butler & Randall, 2013). In the initial stages of the relationship, contagion of sexual arousal is more likely to occur due to blurring of self- and other-boundaries and a heightened susceptibility to one another's emotional and physiological cues. As the relationship progresses, it is beneficial for partners to jointly regulate their sexual arousal levels to reach a balanced, homeostatic state of sexual arousal and to adapt this setpoint in response to varying emotional and relational demands. In long-term sexual relationships, the transition from mere contagion to coregulation could be crucial to keep partners satisfied and help them rewrite their sexual script over the course of their relationship. When examining the role of sexual synchrony over time, it is also worth considering whether synchrony influences partner selection from the outset, with partners aligning their sexual arousal responses early on, indicating an immediate sexual "match." Following up couples over time can reveal patterns of stability and variability in sexual arousal throughout different phases and challenges of the relationship. This may help us understand how adaptive feedback mechanisms contribute to the regulation and stability of the sexual arousal system, ultimately helping us to infer the optimal level of synchrony.

As a concluding remark on the (mal)adaptive value of synchrony for sexual and relationship functioning, we must consider that most studies on interpersonal synchrony are correlational in nature, implying that no conclusions can be made on cause or effect. Studies have treated relationship satisfaction as outcome, predictor, and moderator variable. It has been shown that stronger synchrony relates to various indicators of relationship satisfaction. It has also been found that relationship satisfaction predicts and moderates the strength of synchrony, with partners who report higher levels of relational satisfaction showing significantly greater covariation in their responses (Hu et al., 2022; Palumbo et al., 2017; Timmons et al., 2015). The same applies to the observed link between physiological synchrony and sexual satisfaction. Responding in sync with one's partner may strengthen the feeling of connection during sexual interactions, which contributes to feeling sexually satisfied (Freihart & Meston, 2019). Likewise, it is plausible that sexually satisfied couples feel a stronger connection, which results in stronger levels of physiological synchrony. One could argue that both synchrony and indicators of satisfaction unfold in a self-perpetuating cycle such that partners with a strong relationship will synchronize via conditioned responding and that being synchronous induces feelings of closeness.

How Does Sexual Synchrony Contribute to Sexual Problems?

Ultimately, research on the implications and development of sexual synchrony can offer practical insights into its clinical potential, informing treatments on how to use synchrony to assess and treat sexual and relational problems. Sexual synchrony provides an alternative lens for understanding issues related to inflexibility in adjusting sexual scripts. From this viewpoint, sexual problems may stem from a lack of flexibility to move in and out of synchrony, a skill necessary to navigate the varying demands in a sexual relationship (Mayo & Gordon, 2020). Other potential explanations for sexual problems include the transmission of low arousal between partners, lack of coregulation, difficulty achieving homeostasis, and asynchrony. More concretely, the mere transmission of sexual arousal levels between partners may be beneficial in a high arousing and pleasurable context but induce a downward spiral when (one or both) partners encounter sexual distress. Transmission of low arousal might explain why sexual problems in one partner often go along with sexual problems in the other partner (Dewitte, 2014; Rosen et al., 2019). In the case of sexual distress, it may be more helpful to rely on coregulation whereby the higher arousal partner tries to upregulate the lower arousal partner to maintain or return to their homeostatic setpoint of sexual arousal. Hence, effective coregulation may involve balancing sexual arousal responses rather than striving for similarity. It may also prove useful to show oscillating patterns of high and low synchrony in order to flexibly adjust toward a new sexual homeostasis. Understanding how couples change their setpoint over time and create a new balance of sexual (arousal) responding via coregulation could help a couple rebuild their sexual relationship.

If we assume that sexual synchrony can enhance sexual experiences when used at the right moment and in the right context, it becomes clinically relevant to explore whether partners can become aware of their synchronous sexual arousal responses and whether this can be consciously controlled or trained by instructing couples to induce similarity, thereby enhancing interconnection. Demonstrating that partners can adjust their arousal to engage and influence each other could lead to new therapeutic approaches, teaching couples to use synchrony flexibly and strategically. Such intervention can be supported by the use of mobile physiological sensors to provide real-time biofeedback during sexual encounters at home to guide couples through the training, helping them understand each other's arousal dynamic and work together to enhance mutual pleasure. Note that this type of biofeedback could not only facilitate but also distract the couple by inducing performance demand or failure anxiety.

When using sexual synchrony as a clinical tool, therapists might have to take into account that between-couple variability is common. In their study on heart rate synchrony, Freihart and Meston (2019) have found that some couples displayed heart rate trajectories that tracked each other with remarkable precision, whereas others showed no detectable synchrony. This limits the viability of sexual synchrony as a diagnostic tool, but it could be useful to track the sexual dynamic within a couple over the course of treatment, using synchrony as a pre- and post-measurement. In this context, it is important to carefully define the endpoint of treatment, as sexual synchrony may, for some couples, be more instrumental to sexual pleasure rather than sexual (dys)function.

The clinical potential of sexual synchrony lies in identifying the conditions under which synchrony might enhance sexual experiences and unraveling how couples develop a new sexual set-point over time to regulate their sexual arousal. Understanding the dynamic, bidirectional influences between partners' sexual responses may enable clinicians to plan and deliver interventions that are precisely tailored to the needs of each couple, ultimately improving therapeutic outcomes.

How to Measure Sexual Synchrony? Methodological Challenges and External Validity

Dynamic Models of Sexual Arousal

The rapid growth of research on interpersonal synchrony can, in part, be attributed to recent technological advancements enabling researchers to collect and code intensive repeated measures data from interacting individuals (Ayache et al., 2021). These methods and statistical models have yet to find their way into sex research, a field that, decades after Masters and Johnson, is slowly starting to explore dyadic patterns of psychophysiological sexual responding between partners. While dyadic analyses on psychosocial aspects of sexuality have become increasingly popular, measuring both partners' sexual responses at the biological-physiological level remains largely uncharted.

Unraveling the dynamic pattern of sexual synchrony requires moment-to-moment tracking of various response signals that are measured across different sexual interactions and time points (Marzoratti, & Evans, 2022). To be able to analyze such intensive data sampling, we need advanced mathematical modeling techniques to statistically model and detect patterns of sexual synchrony (e.g., autoregressive vs. cross-lagged, changing vs. stable setpoints) across different time scales (Marzoratti, & Evans, 2022). Dynamic system modeling is one such statistical method that can capture multivariate time-series data to describe and predict interactions between multiple components of different response channels (experience, behavior, physiology) over time (Butler & Barnard, 2019). Using this method, patterns of synchrony can be plotted to detect recurring signals, trends, and sudden changes, allowing us to pinpoint specific thresholds at which synchrony transitions from being adaptive to maladaptive, and to examine whether setpoints change or remain table over time (Berkhout et al., 2023; Butler, 2011). Ultimately, these model-driven data patterns will contribute to formalizing theoretical insights on sexual synchrony during partnered sex. Elaborating on all relevant features (i.e., control parameters, attractors, thresholds, and trends) and complexities of dynamic system modeling and how to statistically model these in the context of sexual synchrony is beyond the scope of this paper, but I refer the interested reader to the relevant literature (Berkhout et al., 2023).

Several unresolved issues remain when using dynamic system modeling to understand sexual synchrony. We need to take into account that different processes operate on different time scales. Genital arousal occurs within seconds, while synchrony between subjective responses takes longer to develop. Selecting the right measurement interval is a challenge because it is unclear yet how long it takes for one person's emotional or physiological response to affect the other, and these effects vary by response type (Timmons et al., 2015; Marzoratti & Evans, 2022). Given the lack of prior research, further studies are needed to determine the optimal time window for capturing synchrony in subjective and genital arousal between partners during sexual interactions. A too-long interval risks correlating irrelevant physiological fluctuations, while a too-short interval may miss important changes. Additionally, common methods like vaginal and penile plethysmography have different endpoints and time courses for men and women, complicating comparisons. To validly conclude that synchrony in genital arousal occurs, it may be necessary to try different methods, such as thermography, or develop new measures like clitoral erection as an equivalent to penile erection.

External Validity of Research on Sexual Arousal

The complexity of measuring sexual synchrony highlights a significant issue. Namely, the lack of research on sexual synchrony may partially be due to the limitations of our measurement tools and the need for an updated experimental paradigm that allows more ecologically valid and naturalistic sexual interactions. Traditional methods, such as measuring subjective and genital arousal of individuals while watching erotic videos on their own, do not reflect the dynamic, reciprocal nature of real-life sexual encounters and is based on the assumption that the same erotic video will evoke sexual arousal in all participants (Chivers & Bailey, 2005; Dewitte, 2014). More ecologically valid paradigms of sexual arousal, such as measuring physiological responses during real-life sexual interactions, are needed to fully understand the dynamics of sexual arousal in couples and to better align research with the real world. Initial steps have been taken by inviting couples to the lab and measuring their sexual arousal responses while sexually stimulating each other (Pawlowska et al., 2024, manuscript submitted for publication). However, further research could extend to home settings, using mobile measures of sexual arousal, to avoid artificial responses. Freihart and Meston (2024) have done pioneering work in this respect by measuring the heart rate of both partners during a series of sexual interactions at home.

What About Intra-Individual Arousal Synchrony?

Including both partners in the lab to study their dynamic sexual interactions not only allows exploring novel questions on sexual covariation *between* partners, it also addresses long-standing questions on (gender differences in) the covariation between subjective and genital arousal *within* persons. Research has shown that men generally exhibit more agreement between these two types of arousal than women (Chivers et al., 2010). However, it is still unclear how sexual arousal responses vary within and between partners during naturalistic sexual interactions. This might be particularly relevant for understanding women's sexuality which is often described as more relationship- and context-dependent (Baumeister, 2000; Peplau, 2003). A dyadic setting allows women to become more emotionally immersed in the sexual experience, potentially revealing whether the lower agreement between subjective and genital arousal commonly observed in women is a methodological artifact of the solitary laboratory setting (Suschinsky et al., 2009). Understanding the implications of intra-personal synchrony (or lack thereof) for interpersonal synchrony is crucial. When subjective and genital arousal do not align within an individual, it can affect the sexual interaction between partners. For instance, when a partner feels sexually aroused but does not experience corresponding genital arousal, or vice versa, this may affect the signals they send to their partner and impact their ability to connect. By examining intra-personal arousal (a)synchrony *during* sexual interactions, we might gain valuable insights into how individual experiences of arousal may affect the dynamics of sexual interactions within couples.

Towards Future Research

Now that a conceptual analysis of sexual synchrony has been provided and its relevance for understanding sexual dynamics between partners has been explained, potential routes to empirically validate the concept will be outlined.

Both lab- and home-based studies are needed to measure covariation between subjective and genital arousal responses in both partners during diverse types of sexual stimulation and in various conditions, while manipulating underlying

mechanisms and contextual factors. These studies can be combined with Experience Sampling Methods (ESM) monitoring daily affect, relationship, and sexual variables at home. This approach can help examine whether distinct patterns of synchrony across various contexts relate to relational and sexual outcomes in everyday life and track how these patterns of synchrony evolve over time. Throughout these studies, it is important to measure multiple response channels beyond only sexual arousal responses to establish the concept's specificity and link psychological states with physiological patterns. This will enhance our understanding of how sexual synchrony contributes to partners' physiological and emotional balance. Additionally, we may study how hormonal responses coordinate between partners as their attachment bond develops and what role sexual synchrony might play herein. Exploring neuroendocrine synchrony during sexual interactions can reveal its benefits for overall sexual and relationship well-being, health, and resilience.

Ideally, longitudinal data could be gathered to examine how sexual synchrony measured at one time point is associated with sexual and relational variables assessed months or years later. This would require repeated data over a long enough time period to observe the development of couple's sexual arousal and satisfaction, ultimately informing us about the causal relationship between sexual synchrony and relational and sexual outcomes. To avoid the need for intensive longitudinal data-sampling, recruiting couples of various relationship lengths and different living status (e.g., living apart or cohabiting) could provide initial insights into whether sexual synchrony develops as a function of relationship features. Furthermore, to determine whether sexual synchrony serves as a functional mechanism for maintaining relationships, we could also experimentally induce synchrony, in the lab and/or at home, and examine whether this leads to improved sexual and relational outcomes. Given that sexual synchrony is likely to vary as a function of relevant individual and relational variables (e.g., attachment orientation, perceived partner responsiveness, relationship satisfaction, past trauma), it is important to consider these as moderator variables, as they are expected to influence the strength and pattern of synchrony.

To examine the clinical value of sexual synchrony, sexually high functioning and satisfied couples could be compared with couples where one or both partners experience sexual problems and/or dissatisfaction. Including samples of couples who are expected to show disrupted patterns of (a)synchrony during sex, such as those affected by attachment and sexual trauma (e.g., Motsan et al., 2021), would also be valuable. Systematically monitoring the temporal pattern of interdependent sexual arousal during emotional and sexual distress could help determine whether transmission of low arousal, lack of coregulation, inflexibility, or even asynchrony underlies sexual problems. Additionally, it is pertinent to explore who drives the sexual interaction in sexual problem couples and what individual or relational characteristics may determine who takes the lead and who follows. A different dynamic arises when the low arousal partner pulls the other partner down or when the high arousal partner lifts the other up. Studying sexual synchrony in a clinical context could provide insight into when and why coregulatory feedback mechanisms fail, help to determine optimal transition moments between synchrony and asynchrony, and recognize adaptive mechanisms to cope with and overcome sexual difficulties.

Finally, it is relevant to explore how sexual synchrony relates to commonly observed phenomena in long-term relationships. One example is sexual desire discrepancies (Dewitte et al., 2020; Mark et al., 2014), occurring when one partner desires sex more frequently or differently than the other. Another example is sexual compliance, i.e., engaging in and consenting to sex without (initial) arousal to please the partner and maintain relationship intimacy (Impett & Peplau, 2003). These concepts may be closely intertwined in romantic relationships because the degree of sexual synchrony can influence how partners navigate and address differences in sexual desire.

Conclusion

This paper introduced the concept of sexual synchrony, which is defined as the temporal, reciprocal, and coordinated interchange between partners' subjective and genital sexual arousal. Building upon the existing literature on interpersonal synchrony and applying this to the sexual domain, sexual synchrony is assumed to rely on a give-and-take process where partners monitor and adjust their sexual arousal responses to maintain a homeostatic level of sexual arousal in their relationship. This paper aimed to explain the relevance and potential implications of being "in sync" during sexual interactions in order to stimulate research on the interface between sex, relationships, interdependence, and dynamic systems. By carefully monitoring patterns of covariation between partners' sexual arousal responses, we may explore the underlying mechanisms disrupting and facilitating sexual synchrony, the implications of sexual synchrony for sexual and relational well-being, its development over time (i.e., stage of the sexual response cycle as well as stage of the relationship), and its potential role in sexual problems. Sexual synchrony may not be inherently adaptive or maladaptive but have different implications depending on the sexual and relational context. Further research is needed to understand how partners build and sustain an optimal level of synchrony over time to discern its implications for the (sexual) relationship, and to identify challenges that may arise. To achieve this, partners may need to adapt their responses flexibly to maintain the appropriate balance between independence and interdependence.

Research on sexual function has advanced significantly, yet the concept of synchrony introduces a novel perspective that merits exploration as it may offer new explanations to understand sexual dynamics. Before incorporating sexual synchrony into clinical practice, it is evident that more research is needed to comprehend its specific dynamics, facilitators and inhibitors, and the implications of synchrony for sexual functioning over time. Finding ways to capitalize on the potential benefits of sexual synchrony and knowing exactly under what conditions it can be harnessed to enhance sexual experiences might suggest areas for increased therapeutic focus within existing treatment protocols. This research could also offer concrete input for developing new personalized interventions that

target specific aspects of arousal synchronization to help couples mitigate unhelpful sexual dynamics.

While this exciting line of research holds promise for the future, it does pose a number of challenges to the field, both on a theoretical and methodological level. The study of sexual synchrony requires a multi-modal approach, combining experimental work with prospective designs and sophisticated measurement tools that can capture multivariate time-series data from different response channels (i.e., experience, behavior, physiology), in a variety of contexts, with a variety of experimental manipulations, in both clinical and non-clinical couples, and in the lab as well as at home. To this aim, new methods are required that can record and analyze dyadic patterns of arousal in a naturalistic setting. The results of this interesting, novel line of research could help building more ecologically valid, dyadic models of sexual arousal and use a synchrony lens to assess and treat sexual and relational problems.

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