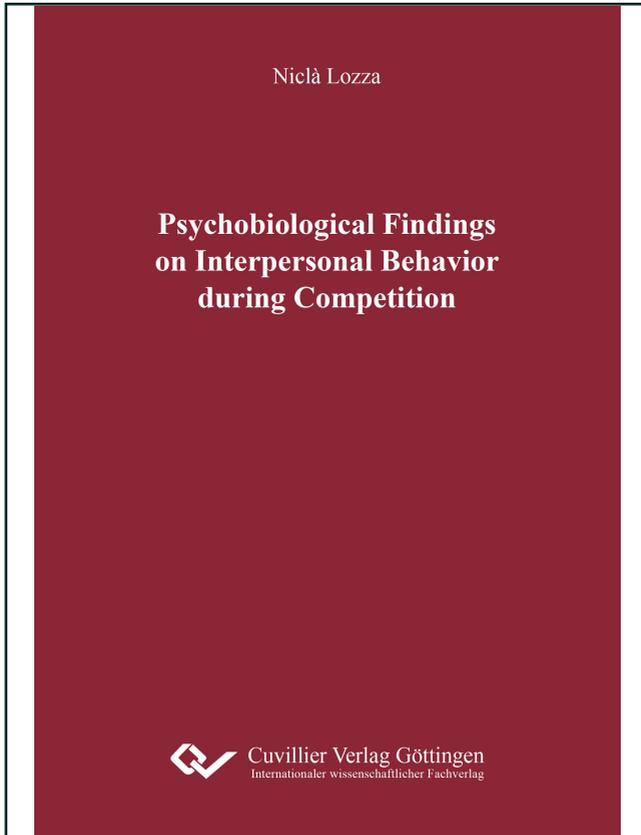




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# **Psychobiological Findings on Interpersonal Behavior during Competition**



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# 1 Introduction

Interpersonal behavior is an essential ingredient of human existence. It highly affects processes within dyads and groups, either by facilitating harmonious, productive, and rewarding interactions or by creating envy and aggression that lead to conflicts. From an evolutionary perspective, getting along with others and creating and maintaining social bonds is critical for both social and physical survival (Lakin, Jefferis, Cheng, & Chartrand, 2003). In clinical contexts, maladaptive interpersonal behavior is a crucial element of several psychiatric disorders such as borderline or antisocial personality disorders (Draycott, Short, & Kirkpatrick, 2015; Kiesler, Van Denburg, Sikes-Nova, Larus, & Goldston, 1990; Russell, Moskowitz, Zuroff, Sookman, & Paris, 2007). At the same time, adaptive interpersonal behavior is central for the experience of satisfactory relationships (Bekker, Croon, van Balkom, & Vermeë, 2008). Also, ‘interpersonal skills’ have been the target of areas such as management, leadership and group dynamics (Spitzberg & Cupach, 2011).

Whether it is for a significant other, work promotions, athletic achievement, or the admiration of peers, social competition characterizes a specific form of interpersonal behavior (Liening, Mehta, & Josephs, 2012). For instance, competition is used to establish a social hierarchy, and this hierarchy influences the allocation of resources in a social group. To achieve high status or competition-related goals, humans employ interpersonal strategies such as knowledge or ability, prosocial behaviors, but also social manipulation or even aggression (Liening et al., 2012). These types of interpersonal behavior affect the behavioral reactions and emotions of all individuals involved and significantly contribute to group dynamics (Buunk, Pollet, Dijkstra, & Massar, 2011).

The psychobiological mechanisms involved in competition are manifold and different approaches have been proposed to investigate this area of social exchange and interpersonal behavior. On the one hand, researchers have examined verbal and non-verbal coordination processes that occur during competition (Markey, Funder, & Ozer, 2003; Naber, Vaziri Pashkam, & Nakayama, 2013; Tschacher, Rees, & Ramseyer, 2014). For instance, research on behavioral imitation has suggested that individuals tend to imitate each other in competitive interaction (Ruys & Aarts, 2010), even when imitating an opponent is against the achievement of the individual goal (Naber et al.,



2013). Furthermore, others have shown that individuals adjust their verbal and non-verbal behavior more in competitive tasks than in cooperative tasks (Markey et al., 2003), and that task outcome depends on coordination of body movements (Abney, Paxton, Dale, & Kello, 2015). However, research on interpersonal coordination processes during competition has provided mixed results, predominantly due to methodological issues (Altmann, 2013).

On the other hand, research has also investigated the ‘social endocrinology’ that underlies the drive to engage in competition and competition-induced hormonal dynamics (Carré & Olmstead, 2015). To date, a great deal of psychoendocrinological research has explored the role of the androgen testosterone, a hormone that has masculinizing effects on an individual (Liening et al., 2012). Broadly, research indicates that testosterone strongly influences dominance behaviors in humans (Mazur, 1985). However, research is progressively shifting away from classical approaches that focus on single hormones toward hormone interactions to describe the social endocrinology of competition (Mehta & Josephs, 2010). Furthermore, contextual factors determining to what extent hormones affect competitive behavior still need to be addressed.

The present work aims to contribute to the explanation of interpersonal behavior during competition by exploring verbal and nonverbal coordination processes and by examining the predictive value of interacting hormones. This thesis consists of three main parts. The first part provides a theoretical background to the research questions under study. It introduces and defines the key concepts to explain interpersonal behavior and then focuses on the specific form of competition. Afterwards, endocrine markers as determinants of competitive behavior are discussed. The first part concludes with an integration of the theoretical and empirical findings and the derivation of the study hypotheses. In the second and core part of the thesis, two empirical studies are presented. Finally, the thesis concludes with a summary and a critical discussion of the main findings and implications for future research.



# **PART I: THEORETICAL BACKGROUND**



## 2 Interpersonal Behavior in Competition

This first chapter focuses on interpersonal behavior, which serves as the main dependent variable in the two empirical studies described in the second part of the present thesis. The chapter starts with an often-used framework for studying interpersonal behavior, namely interpersonal theory, including its key concept called complementarity. Thereafter, the theory of embodiment will be introduced which offers a framework for understanding nonverbal synchrony. Together with complementary, nonverbal synchrony is investigated in the first empirical study. Afterwards, the focus lies on interpersonal behavior during competition. A review of the literature on the specific form of intrasexual competition, along with influencing factors on competition will be presented. Additionally, empirical findings on complementarity and nonverbal synchrony specifically on the context of competition are described.

### 2.1 Relevant Theories on Interpersonal Behavior

Prior to focusing on competitive interpersonal behavior, the theories of interpersonal behavior and embodiment are discussed separately. Subsequently, both theories will be integrated and their strengths and limitations are presented.

#### 2.1.1 Interpersonal Theory

One of the most influential theoretical frameworks for the explanation of interpersonal behavior is interpersonal theory. Historically, Sullivan's (1953) interpersonal theory of psychiatry was among the first to point out the primary importance of interpersonal contexts. Sullivan suggested that to understand personality, individuals should be analyzed within their interpersonal situations and behaviors. This assumption was made accessible to research by Leary (1957), who described a circumplex model termed the *interpersonal circumplex*. The main principle of interpersonal theory is that most interpersonal behavior can be captured along the two orthogonal dimensions of dominance-submissivity and friendliness-hostility, which constitutes the interpersonal circumplex. From a motivational perspective, the need for agency (self-assertion,

achievement, power) and the need for communion (emotional connection with others) build the driving forces underlying the two dimensions (Wiggins, 2003).

A further principle of interpersonal theory, complementarity, was introduced by Carson (1969). According to Carson, complementarity occurs when individuals show reciprocity on the dominance dimension and similarity on the friendliness dimension (e.g. dominance in person A leads to submission in person B and friendliness in person A leads to friendliness in person B, and vice versa). Furthermore, interpersonal theory suggests that when individuals tend to respond to others in a complementary way, the relationship is experienced as strengthened and more pleasant (Carson, 1969; Kiesler, 1983; Leary, 1957). In other words, the reactions received from a counterpart, which are inconsistent with one's own self-concept, complicate interpersonal behavior. Notably, complementarity includes verbal and nonverbal cues which are present during dyadic interactions (Sadler, Ethier, Gunn, Duong, & Woody, 2009).

Finally, the third principle of interpersonal theory addresses the vector length (Wiggins, Phillips, & Trapnell, 1989). Mathematically, the term 'vector length' addresses the value, which is attributed to a person in the two-dimensional circular space of the interpersonal circumplex. Hence, a vector starts in the middle of the interpersonal circumplex and ends at a given individual's value. Broadly, according to interpersonal theory, the longer the vector the higher the likelihood that an individual shows maladaptive or dysfunctional interpersonal behavior, independently from the dimension (Wiggins et al., 1989). In this sense, maladaptive or dysfunctional behavior is characterized by rigidity and inflexibility (Tracey, 2005).

In the course of numerous revisions, the circular structure has led to a variety of psychological tests and classifications by dividing the circle into segments (Gurtman, 2001; Horowitz, Rosenberg, Baer, Ureño, & Villaseñor, 1988; Kiesler, 1983; Wiggins et al., 1989). Figure 1 provides an example of segmentation of the interpersonal circumplex into octants, as proposed by Wiggins et al. (1989). Furthermore, various terms have been used to describe the x-axis, such as friendliness, affiliation, love or warmth. Similarly, the y-axis has been termed dominance, power, influence or control (Horowitz, Turan, Wilson, & Zolotsev, 2008). More recent approaches have also investigated time dependent patterns of the interpersonal circumplex by capturing mo-

ment-to-moment changes over time (Lizdek, Sadler, Woody, Ethier, & Malet, 2012; Sadler et al., 2009). To date, the simplicity and comprehensiveness of the use of just two dimensions has highly contributed to its application in a variety of topics, including psychopathology, social comparisons, relationship satisfaction, interpersonal complementarity, and clinical or therapeutic settings (Locke, 2011).

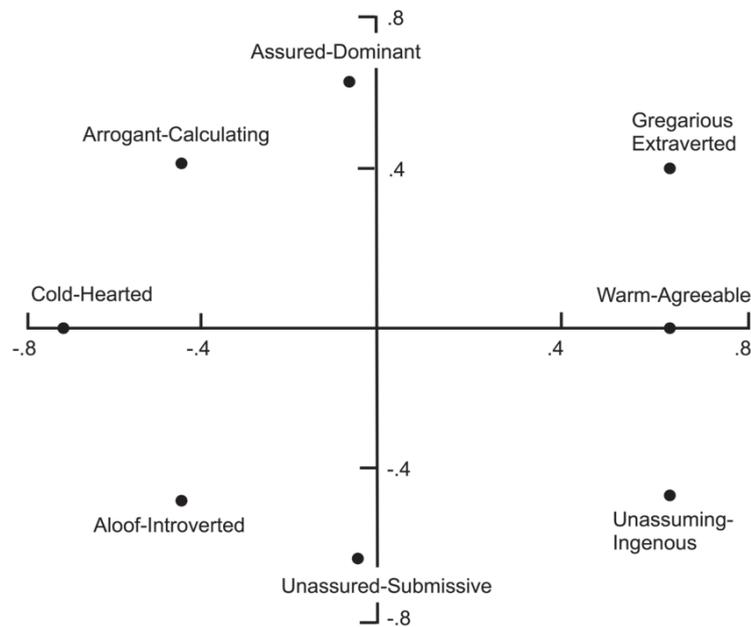


Figure 1: Circumplex structure defined by octants (adapted from: Wiggins et al., 1989).

### 2.1.2 Embodiment

The theory of embodiment offers a theoretical framework to interdependently capture cognitive, emotional and nonverbal cues during interpersonal interactions. The theory builds on the phenomenological philosophy of Merleau-Ponty (1962), emphasizing that the body influences, and at the same time, is influenced by behavior, feelings and cognition. Taking this into consideration, embodiment theorists attempt to not consider approaches that reduce mental processes to neural correlates (Storch, Cantieni, Hüther, & Tschacher, 2006; Tschacher & Bergomi, 2011). As visualized in Figure 2, the assumption of bi-directionality between the body and the cognitive-affective system plays a central role within this theoretical framework. To address this concern, Koch (2011) differentiated between impression (moved by movement) and expression (moved to move).

The expansion of research on body feedback experiments has provided support for the assumption of bi-directionality (for a review see Suitner, Koch, Bachmeier, & Maass, 2012). For instance, in an often cited study, Strack, Martin and Stepper (1988) manipulated the tension of facial muscles by randomly assigning their participants to three different conditions. In the first one, participants held a pen between their lips; in the second, they held it between their teeth; and in the third condition, participants held the pen in their non-dominant hand. Therefore, three different forms of embodiment were evoked. In the first condition, muscles involved with smiling were inhibited. In contrast, these muscles were activated in the second condition, whereas the third condition served as control group. As a dependent variable, participants were told to rate the funniness of cartoons. Participants in the second condition rated the cartoons as funnier than participants in the first condition and the control group. Moreover, participants in the first condition rated the cartoons as less funny than participants from the control condition. The authors concluded that facial muscles directly and unconsciously impact the processing of emotions.



Figure 2: Bi-directionality between the cognitive-affective and the motor system (adapted from: Koch, 2011).

Importantly, the assumption of bi-directionality is not only believed to play a role on an individual level, but also on an interactional level. Accordingly, contemporary systems theory attempts to explain interpersonal functioning by introducing the term of *synchronization* (Haken, Kelso, & Bunz, 1985; Tschacher & Dauwalder, 2003). In this context, synchronization “[...] means that previously independent variables of a system can become entrained, i.e. increasingly correlated [...]” (Tschacher, Rees, & Ramseyer, 2014, p. 1). Research on the neural bases of synchronized facial movement indicates that synchronization plays an important role in social communication (Frith,

2009). Moreover, the exchange of emotional signals seems to be processed rapidly and non-consciously (Tamietto & de Gelder, 2010). Hence, as pointed out by Frith (2009, p. 3457), movement impacts social communication, since it provides “public information that observers can use”. A visual example of this process is presented in Figure 3, which demonstrates the circular and constantly modifying interplay between two individuals, termed ‘interbodily resonance’ (Fuchs & Koch, 2014).

Taking this into account, Koch (2011, p. 16) defines Embodiment as “[...] field of research, in which the reciprocal influence of the body as a living, animate organism, as well as its movements (in quality and shape), and cognition, affect and behavior are investigated with respect to their expressive and impressive functions (individual, interactional and extended, i.e., including person-person and person-environment interactions)”.

To date, researchers have used a variety of terms to characterize the phenomenon of synchronization (Altmann, 2013). In the present thesis, synchronization is addressed by the term of *nonverbal synchrony*, as proposed by Ramseyer (2008; see also Ramseyer & Tschacher, 2010). Accordingly, nonverbal synchrony is defined by the amount of coordinated overall bodily movement between two individuals. Although nonverbal synchrony is characterized by imitative behavior, it differs from other related concepts, such as behavioral mimicry, since it includes simultaneous movement, as well as time-delayed coordinated movement (Boker, Xu, Rotondo, & King, 2002; Chartrand & Lakin, 2011). Furthermore, it is important to note that the present definition of nonverbal synchrony does not include qualitative aspects of interpersonal behavior such as smiling or posture (discussed in more detail below).

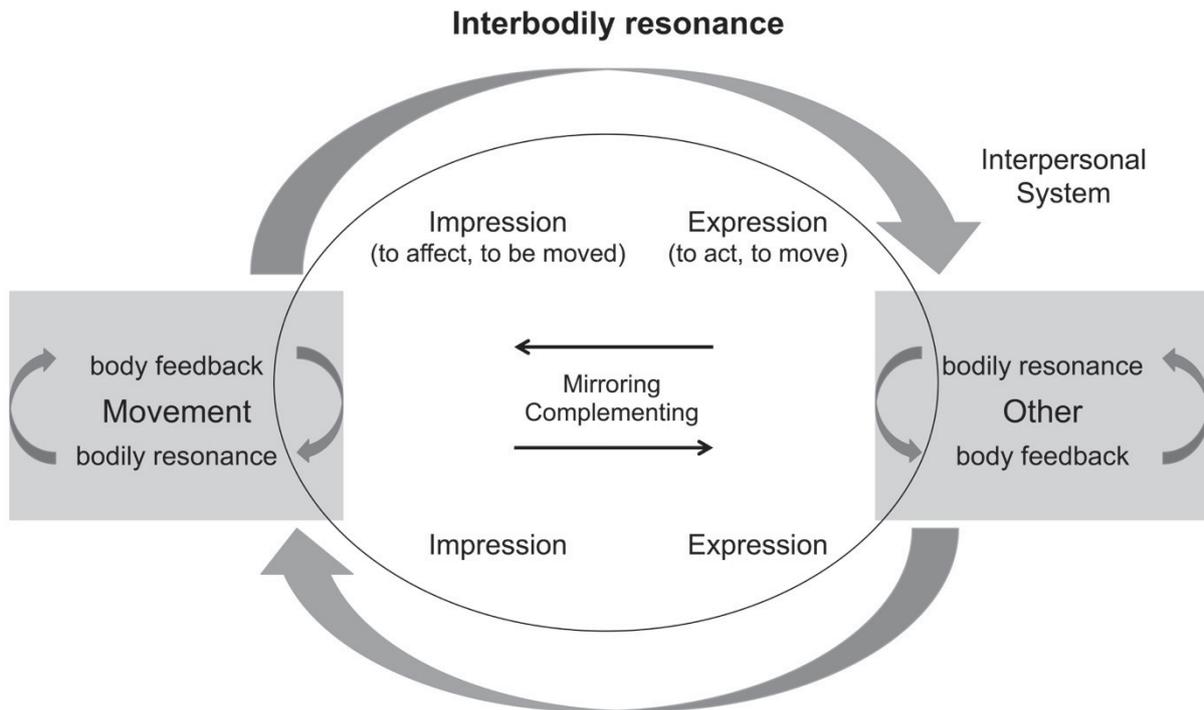


Figure 3: Interbodily resonance model with the components mirroring, complementing movements, body awareness, and kinaesthetic empathy (adapted from Fuchs and Koch, 2014).

### 2.1.3 Summary

The frameworks of interpersonal theory and embodiment are quite compatible. For instance, both theories emphasize a systemic approach in which interpersonal behavior is seen as a product of processes within and between communicating individuals. Correspondingly, the importance of conceptualizing humans as social beings with a basic need to belong is stressed out (Baumeister & Leary, 1995). Furthermore, the theories overlap by including nonverbal behavior as one element of interpersonal communication. However, nonverbal behavior is also one of the aspects in which the theories differ. Whereas nonverbal behavior is the essential component within the research of nonverbal synchrony, interpersonal theory also captures verbal behavior in social functioning. Another difference between the two conceptual frameworks is that interpersonal theory explicitly addresses how personality traits influence and, although to a lesser extent, are influenced by interpersonal behavior. Moreover, it remains unclear whether complementarity in terms of dominance or friendliness are correlated with nonverbal behavior (Paxton & Dale, 2013).