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Paolini, Stefania, Harris, Nicholas, C. & Griffin, Andrea S. "Learning anxiety in interactions with the outgroup: towards a learning model of anxiety and stress in intergroup contact" Published in *Group processes & Intergroup Relations*, Vol. 19, Issue 3, Pages 275-313, (2016).

Available from: <http://dx.doi.org/10.1177/1368430215572265>

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Accessed from: <http://hdl.handle.net/1959.13/1323755>

Learning Anxiety in Interactions with the Outgroup:
Towards a Learning Model of Anxiety and Stress in Intergroup Contact

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2014, Version 3; Word count: 9,523 (main body of text only)

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PENULTIMATE DRAFT OF:

Paolini, S., Harris, N., & Griffin (2014, accepted 17/11/14). Learning Anxiety in Interactions with the Outgroup: Towards a Learning Model of Anxiety and Stress in Intergroup Contact
Group Processes and Intergroup Relations. Contact e-mail: Stefania.Paolini@newcastle.edu.au

Abstract

While '*knowledge learning*' about the outgroup has been regarded as one of the key mechanisms for the contact-prejudice relation since the contact hypothesis' first inception (Pettigrew & Tropp, 2008), '*learning*', more broadly, has rarely been used as an explanatory framework to investigate the consequences of intergroup contact. In this article, we lay the foundation of a learning model of anxiety and stress in ingroup-outgroup interactions. We distinguish between episodic and chronic anxiety responses to the outgroup and recommend investigations on the complexities of their dynamic interplay, as individuals accumulate and dynamically integrate their experiences with the outgroup over time. Through a review of established and emerging psychophysiological and behavioral research of anxiety during ingroup-outgroup interactions, we identify evidence consistent with this dynamic outlook of intergroup contact effects. In this context, we also advance novel and untested predictions for future investigations onto the temporal integration of contact effects during an individual's lifespan.

Key words: intergroup contact, intergroup anxiety, learning, generalization, psycho-physiology

Despite the well-established idea that intergroup contact improves intergroup relations because it increases knowledge about the outgroup (Allport, 1954), social psychological research using learning as an explanatory framework to investigate the consequences of intergroup contact is scant (Eller & Paolini, 2011). This may be because this tradition narrowly defines 'learning' as 'knowledge learning' or learning about outgroup characteristics and cognitions (see e.g., Pettigrew & Tropp, 2008). We redress this by re-defining intergroup contact, more broadly, as *the process by which we learn about the outgroup*. From this broader stance, during intergroup contact, we do not simply acquire new knowledge about the outgroup and its members, we also learn about modal affective responses, emotions, and evaluations typically associated with the outgroup (see also Stephan, 2014). For instance, intergroup contact offers the opportunity to learn to be anxious towards, and around the outgroup, and the opportunity to revise those anxieties—we call this process of revising affective responses to the outgroup in light of new outgroup experiences, '*anxiety learning*'.

In this article, we review old and new research on intergroup anxiety in ingroup-outgroup interactions using a new learning model of intergroup anxiety and stress. We first define intergroup anxiety and discuss its central role within the intergroup contact literature; we revisit Blascovich and colleagues' influential study (Blascovich, Mendes, Hunter, Lickel, & Kowai-Bell, 2001) identifying two key components of the model. The following section then outlines the model's organizing principles and describes its key features and properties. We then discuss a new generation of research, which measures psychophysiological and behavioral manifestations of intergroup anxiety and stress to assess changes in anxiety over time (i.e., '*anxiety learning*') during contact. We argue that these emerging time-sensitive methodologies are powerful tools for testing the predictions generated by the anxiety learning model. We also offer an overview of new data from our own research laboratory, bridging methods from the learning and conditioning research tradition and contemporary investigations of intergroup phenomena.

We aim to demonstrate that the appeal of contemporary research on intergroup anxiety rests in its ability to test new and complex segments of a time-bound process of intergroup anxiety learning, whereby episodic and chronic process variables interact over time in a complex and non-linear fashion.

Using the learning model, we identify some novel and untested predictions about how episodic and chronic process variables may interact, which we hope will guide future research.

Intergroup Anxiety Shapes Intergroup Relations, and Determines Whether Individuals Will Engage and Benefit from Intergroup Contact

Recent interest in intergroup anxiety reflects a broader cultural zeitgeist and a growing attention to how affect and emotions shape intergroup processes more generally (Esses & Dovidio, 2002; Mackie, Devos, & Smith, 2000), and ingroup-outgroup interactions or 'intergroup contact' more specifically (Devine, Evett, & Vasquez-Suson, 1996; Greenland & Brown, 1999).

Intergroup anxiety has acquired a central role in the intergroup contact literature. At the broadest level, intergroup anxiety stems from negative expectations about ingroup-outgroup interactions and emerges when outgroup members are seen or expected to pose a threat to the ingroup or individual ingroup members' goals, motives, or sensitivities (Cottrell & Neuberg, 2005; Plant & Devine, 2003; Smith, 1993; Stephan, 2014; Stephan & Stephan, 2000). Empirical investigations, however, focus on a range of specific negative expectations (e.g., threats to physical integrity, Mallan, Sax, & Lipp, 2009; threats of rejection, Mendoza-Denton, Pietrzak, & Downey, 2008; threats of uncertainty, Plant & Devine, 2003). To complicate matters, several of these alternative sources of anxiety can co-exist at any given time and contribute to anxiety's net impact on the individual and group (Blascovich, Mendes, Hunter, & Lickel, 2000; Greenland, Xenias, & Maio, 2012).

There is growing evidence for the detrimental effects of intergroup anxiety. Intergroup anxiety is associated with increased concerns for the self (Vorauer & Kumhyr, 2001), negative emotions (Crandall & Eshleman, 2003), simplified information processing and reduced attention to disconfirming information (Wilder & Shapiro, 1989), increased dominant responses (Islam & Hewstone, 1993), and decreased task performance (Blascovich et al., 2001, Mendes, Blascovich, Hunter, Lickel, & Jost, 2007a). Recent experimental research has started to isolate acute and chronic adverse consequences of intergroup anxiety on health (Mendes, Gray, Mendoza-Denton, Major, & Epel, 2007b; Trawalter,

Adam, Chase-Lansdale, & Richeson, 2012).

The consequences of intergroup anxiety for the groups involved in contact are also well documented. High intergroup anxiety is typically associated with negative intergroup judgments, including prejudice (Bizman & Yinon, 2001), low perceived variability (Islam & Hewstone, 1993), overt hostility (Plant & Devine, 2003), and unwillingness to engage in future outgroup contact (i.e., informal group segregation; Greenland, Masser, & Prentice, 2001). Conversely, *reduced* intergroup anxiety explains why intergroup contact typically *improves* intergroup judgments. For instance, investigations of first and second-hand experiences of cross-community friendship in sectarian Northern Ireland predicted reduced outgroup prejudice and heterogeneous outgroup perceptions, an effect mediated by sizeable reductions in intergroup anxiety (Paolini, Hewstone, Cairns, & Voci, 2004a).

In 2006, we identified only ten studies documenting the mediational role of intergroup anxiety for the contact-prejudice link (Paolini, Hewstone, Voci, Harwood, & Cairns, 2006; see also Turner, Hewstone, Voci, Paolini, & Christ, 2007). This number has grown considerably since and now includes longitudinal mediational data (e.g., Binder et al., 2009; Swart, Hewstone, Christ, & Voci, 2011). Recent research has also led to the appreciation of the generality of these effects: Similar mediational findings have been found for extended (e.g., Turner et al., 2007), vicarious (Mazziotta, Mummendey, & Wright, 2011), and imagined contact (West, Holmes, & Hewstone, 2011). Hence, it is now generally recognized that virtually *any* positive outgroup interaction—whether face-to-face, imagined, or via conversations with ingroup members—can improve intergroup relations by reducing the anxiety individuals feel or anticipate feeling in the presence of the outgroup.

Pettigrew and Tropp (2008) recently meta-analyzed studies testing for mediators of the contact-prejudice link to compare the mediational role of decreased anxiety, increased outgroup knowledge, and increased outgroup empathy after contact. While all three mechanisms demonstrated a significant mediational effect and contributed to explaining the contact-prejudice link, intergroup anxiety was found to be the most robust mediator (however, cf. Swart et al., 2011). Thus, among various psychological

underpinnings of intergroup contact effects, reduced intergroup anxiety is prominent and thus a legitimate target for social interventions aimed at improving intergroup relations.

More recently, intergroup contact scholars have recognized that intergroup anxiety should be lessened not only to reduce its *direct* negative consequences on intergroup judgments (e.g., prejudice, stereotyping, etc.), but also to contain its *indirect* negative effects on one's willingness to engage in further outgroup contact. Experimental and longitudinal evidence now complements established correlational evidence of an anxiety-contact avoidance link (see Greenland et al., 2012; Henderson-King & Nisbett, 1996; Levin, Van Laar, & Sidanius, 2003; Page-Gould, 2012; Page-Gould, Mendoza-Denton & Tropp, 2008; Plant & Butz, 2006; cf. correlational evidence in Paolini et al.'s, 2006 Table 11.1) and demonstrates that intergroup anxiety typically *causes* people to avoid intergroup interactions. Based on functional analyses of emotions, anxiety and other negative affective states signal threats to the safety and integrity of the organism, and as such, they trigger physiological and behavioral responses, the main function of which is to limit further damage and threat. Hence, one of the most common outcomes of these processes is the avoidance of potentially dangerous or threatening stimuli—in intergroup settings, the avoidance of contact with outgroup members.

Yet, approach motivators – including individuals' promotion focus, extroversion, motivation to self-expand, egalitarian worldviews etc. – have the potential to significantly attenuate and possibly even revert these adverse effects of intergroup anxiety (Mendes et al., 2007b; Page-Gould, 2012; Wright, Aron, & Tropp, 2002) by encouraging the individual to actively address and approach (vs. avoid) *subjectively positive* intergroup stressors and harness the associated heightened physiological activation towards increased task engagement, improved performance, and salutary health responses (for initial evidence, see Epel, McEwen, & Ickovics, 1998; Mendes et al., 2007b; Page-Gould, 2012; Page-Gould et al., 2008; Page-Gould, Mendes, & Major, 2010). Hence, among some individuals and under certain conditions, intergroup contact with acute task demands can lead to beneficial changes in physiology and behavior both in the short term (e.g., preparatory and challenge responses; Mendes et

al., 2007b) and long term (e.g., chronic salutary health responses; Page-Gould et al., 2010; Trawalter et al., 2012). Therefore, while contact avoidance following intergroup anxiety may be widespread and a default response for most people, physiological reactivity and anxiety are not always harmful for the individual, the intergroup interaction and, by extension, intergroup relations.

To ensure that intergroup harmony can be achieved and maintained through peaceful intergroup interactions, and individuals' wellbeing during ingroup-outgroup interaction protected, efforts should focus on increasing knowledge of intergroup anxiety. This requires an improved understanding of how intergroup anxiety *develops* in the first place and *changes over time* (aka. anxiety learning), as individuals integrate a range of experiences with the outgroup over their lifespan.

To this aim, we revisit research by Blascovich and colleagues (2001) next, and show how their results integrate findings from two traditionally independent strands of research on intergroup contact and anxiety, and capture two distinct effects of intergroup contact on anxiety, each with their own unique time-course. These two effects will become key building blocks of our learning model of intergroup anxiety.

Intergroup Anxiety is Exacerbated in the Present and Reduced in the Long Run: Recognizing Distinct Contact-Anxiety Links

In 2001, Blascovich, Mendes, and colleagues (Blascovich et al., 2001) published very influential research. In this work, non-stigmatized individuals (i.e., healthy White American college students) were asked to become familiar, and interact with, an unknown individual who was either a stigmatized individual (e.g., an individual with a facial birthmark, Black ethnicity, low SES status; intergroup condition) or an unfamiliar non-stigmatized individual (i.e., a White/control individual; intragroup condition). After a short face-to-face interaction with their contact partner, participants were asked to deliver a short (anxiety-provoking) video-recorded speech, which they expected to be later reviewed by their contact partner. While delivering their speech, all participants were attached to physiological equipment that recorded changes in cardiac and hemodynamic (blood flow) output.

Across three experiments, intergroup contact participants displayed signs of heightened anxiety, whereas intragroup contact participants did not. Participants paired with a stigmatized partner exhibited cardiovascular reactivity indicative of a threat response, typical of a situation where people expect task demands to outweigh their task resources (Blascovich & Tomaka, 1996), and which usually results in contact avoidance. In contrast, intragroup contact participants exhibited reactivity indicative of a challenge response, signaling that they evaluated their personal resources to be sufficient, or in excess of task demands, a response typically associated with approach behavior. Moreover, the intergroup (vs. intragroup) participants showed poorer performance during a cooperative task (i.e., fewer words found in a word-finding task).

These systematic differences in psychophysiological and behavioral anxiety between the intergroup and intragroup contact participants reflect the *acute anxiety-provoking* effects that *discrete* experiences of intergroup contact can exert *in the present* – at least when individuals are engaged in motivated performance tasks like those extensively used in experimental tests of the contact-anxiety link. Hence, as the individual is pressed by a difficult task and/or social evaluation, *intergroup* exchanges typically cause *higher* levels of anxiety than intragroup exchanges.

While Blascovich and colleagues' 2001 article epitomizes a new generation of experimental research on intergroup contact and anxiety, their basic intergroup vs. intragroup effect is not entirely new. Similar evidence was isolated in earlier studies and has been replicated several times since. Table 1 summarizes intergroup contact work on physiological and/or behavioral anxiety, which has used a intergroup vs. intragroup contact experimental design, with most studies focusing on ethnicity as the intergroup dimension (however, cf. Townsend, Major, Gangi, & Mendes, 2011).¹.

--INSERT TABLE 1 HERE--

Table 1 classifies studies by operationalizing intergroup anxiety in four distinguishable ways. First, studies were classified along the tripartite operational definition of anxiety and threat responses (Blascovich et al., 2001; Mendes, Blascovich, Lickel, & Hunter, 2002). Drawing from multifaceted

models of generic anxiety and emotions (Lang, 1985; Zajonc, 1998), these scholars discriminate between: (1) *physiological* markers (i.e., autonomic system responses, like sweating and increased heart rate), (2) *behavioral* markers (e.g., non-verbal cues, depleted performance, and contact avoidance), and (3) *subjective* markers (i.e., self-reported responses). Second, each anxiety measure was classified as an individual-level (individual-specific) or group-level (broadly representative of the entire outgroup) measure. Third, the appraisal source of the anxiety measures was classified using Greenland et al.'s (2012) distinction between *outgroup-focused* anxiety (i.e., anxiety resulting from perceived outgroup's threats) and *self-focused* anxiety (i.e., anxiety resulting from concerns over self-standard and ingroup-standards). Finally, measures were coded for whether they were continuous or discrete.

Irrespective of how anxiety is operationalized, the extant experimental work reveals convergent evidence for reliable differences in anxiety between intergroup and intragroup contact conditions. Critically, these differences are *always* in the direction of higher anxiety in the intergroup (vs. intragroup) contact condition (however, see Mendes & Koslov, 2012). Hence, it is evident that in the vast majority of experimental tests, discrete interactions with outgroup members cause an increase in anxiety levels—i.e., a positive and excitatory link between intergroup contact and anxiety.

Since anxiety is an aversive emotion, it typically has a negative impact on health and performance, acts as an avoidance motive for intergroup contact, and has detrimental effects on intergroup judgments. In other words, the outcome of discrete experiences of intergroup contact—at *least in the short term*—is detrimental for both the individuals immediately involved and the intergroup relations in which these individuals are embedded.

Curiously, while the immediate, often adverse effects of intergroup anxiety on health and performance have begun to be acknowledged in the literature (e.g., Mendes et al., 2007b; Trawalter et al., 2012; see earlier section), this is not so for the short-term detrimental effects of intergroup contact on intergroup judgments, group-level variables, and intergroup relations more broadly. Thus, despite

the straightforward bleak *implications* of intergroup-intragroup differences in anxiety for intergroup relations, most current experimental tests of the contact-anxiety link have not tested these implications directly. Of 60 studies identified (Table 1), only seven (11.67%) included group-level variables—like measures of outgroup prejudice, outgroup stereotyping, outgroup trust etc.—as outcome variables.² Hence, these studies do not help in ascertaining whether laboratory intergroup interactions, besides heightening the contact partners' anxiety, also increase prejudice, stereotyping, and discrimination towards the entire outgroup and, thus, adversely impact the quality of intergroup relations more broadly.

The lack of experimental tests on group-level measures limits researchers' awareness that intergroup contact may have sharply different short-term vs. long-term effects and that any dissociations over time need to be investigated empirically and explained theoretically. As a result, this gap slows the development of a model that makes integrated predictions for both individual-level and group-level effects of intergroup contact over time and their possible interactions.

Intergroup contact does not necessarily result in high intergroup anxiety, however: Blascovich et al. (2001) captured distinct short vs. long-term effects of intergroup contact on intergroup anxiety. In a third experiment, White/control individuals (i.e., non-stigmatized) interacted with a Black (intergroup) or White (intragroup) contact partner. The *overall amount* of close intergroup contact participants reported having had with Black people in general *prior to* coming to the laboratory moderated their physiological responses. Specifically, prior contact did not moderate physiological responses for intragroup contact participants, whereas threat responses among the intergroup contact participants were higher among those who reported having had *limited* prior contact with the outgroup; they were significantly weaker (and non-significant on some indicators) among those who had had *more* prior close contact. These moderation findings map closely onto extensive cross-sectional correlational research on anxiety and contact (see research listed in Table 11.1 of Paolini et al., 2006). In mainstream, traditional correlational research, participants' prior *histories* (vs. discrete experiences) of contact with the outgroup typically ensue beneficial and *not* detrimental effects on intergroup anxiety

(e.g., Paolini et al., 2004a; Paolini, Hewstone & Cairns, 2007; Pettigrew & Tropp, 2008). Hence, this research tradition returns an extensive body of evidence for a negative and inhibitory link between intergroup contact and anxiety.

Blascovich et al.'s approach was ground breaking since it isolated in a single design immediate and acute anxiety-inducing effect of discrete contact experiences and the potentially slower anxiety-reducing effects of accumulated prior intergroup contact. That is, by randomly allocating participants to an intergroup-intragroup between-group design, and then showing that accumulated contact protected participants against acute or episodic anxiety experienced during a discrete contact experience, Blascovich and colleagues demonstrated that the immediate anxiety-provoking effects of discrete intergroup contact, once integrated over time through repeated and accumulated contact, produce a long-term beneficial anxiety-reducing effect.

This temporal integration between short-term and long-term effects of intergroup contact on anxiety is displayed in Figure 1. The diagram illustrates Blascovich et al.'s moderating effect of prior, accumulated contact as two group means along the episodic anxiety y-axis, for 'Low contact' and 'High contact', in the bottom panel. The diagram shows that this effect is the same beneficial effect of intergroup contact as captured in abundant past correlational research, and as displayed by the inclined slope for the relationship between intergroup contact and chronic anxiety in the diagram's top panel. Also, while correlational studies typically do *not* include an intragroup/control condition, we used a dashed line in the diagram's top panel to indicate a hypothetical correlational data set showing no relationship (or a zero-slope) between *inter*-group contact and *intra*-group anxiety. Thus, the graph identifies two equivalent inter/intra-group differences in anxiety (the 'D' in each of the top and bottom panels) in the two research traditions³ and unveils similarities between the findings of different research traditions otherwise masked by systematic differences in research designs.

--INSERT FIGURE 1 HERE--

From this vantage point, the two *prima facie* contradictory contact-anxiety effects detected by

Blascovich et al. and by distinct research traditions are no longer at odds with each other; rather they fit together nicely in a temporally integrated outlook of intergroup contact experiences over time. However, we recognize that these distinct contact-anxiety effects can also be explained by invoking factors and processes other than temporal integration.⁴

Among the many factors that differentiate the methods in the experimental vs. correlational research traditions (Paolini et al., 2006), three stand out as suitable -- alternative but complementary -- explanations of distinct contact-anxiety effects: (i) contact valence, (ii) the on-line/memory-basis of the interaction, and (iii) individuals' motivational goals. In vivo interactions between the contact partners in most experimental tests are skewed towards negativity: These interactions are objectively more negative, than positive, since the participants' primary task is to complete difficult cognitive-behavioral tasks under expected or actual social evaluation rather than enjoying the contact partner's company (see Blascovich & Mendes, 2010; Dickerson & Kemeny, 2004 for methodological foundations); this negativity bias may be further amplified by attentional and encoding biases towards negative (vs. positive) aspects of the interaction and contact partner during on-line processing (Baumeister et al., 2001).

In contrast, correlational studies are biased towards sampling more positive interactions (Graf, Paolini, & Rubin, 2014; Paolini, Harwood, & Rubin, 2010; Pettigrew, 2008), where researchers typically probe retrospective self-reports of past interactions with outgroup members, as they took place in the field or in structured prejudice-reduction settings (Pettigrew & Tropp, 2006). Thus, they recruit a more variable and positive range of motivational states and valences (Graf et al., 2014; Paolini et al., 2010); this potential positivity bias may be further amplified by retrieval processes that favor positive (vs. negative) contact experiences (Graf et al., 2014; Unkelbach, Fiedler, Bayer, Stegmüller, & Danner, 2008). Hence, experimental studies return positive contact-anxiety effects because they disproportionately focus on on-line negative contact experiences; correlational studies return negative contact-anxiety effects because they focus on retrieved positive contact experiences.

From our theoretical perspective, however, these positive and negative contact-anxiety links are more than the mere byproduct of differences in negative and positive contact: They are the constituent building blocks of a novel model of anxiety learning in intergroup contact that temporally integrates contact effects on anxiety over the individual's lifespan.

In the next section, we first outline a broad learning meta-theoretical framework to intergroup contact effects, against which we then anchor our learning model of anxiety. We call the former 'meta-theory' and the latter 'model' purposely, to stress marked differences in breadth and supporting evidence: The former is a broad, overarching, testable, but yet untested, theory; the latter is more narrow, more precise in its predictions, and already enjoys supporting evidence.

A Learning Outlook to Intergroup Contact Effects

To discuss intergroup contact in a temporally integrated framework, we conceptualize intergroup contact as the process by which we learn about the outgroup. During intergroup contact, we acquire new knowledge about the outgroup and its members, and we learn about modal affective responses, emotions, and evaluations typically associated with the outgroup. As a consequence, our responses towards the outgroup may change, for better or worse, over time – through a learning process. With relation to anxiety, intergroup contact offers the opportunity to learn to be anxious towards the outgroup, but also to revise those anxieties. It is these changes in outgroup anxiety over time that we operationally define as 'anxiety learning'.

Organizing Principles of Inductive and Deductive Learning

Five organizing principles can be used to describe the time-course of affective, evaluative, and cognitive processes during ingroup-outgroup interactions: (1) contact experiences are discrete learning experiences with individual outgroup members and about specific ingroup-outgroup interactions, which inform about the cognitions, affect, emotions and evaluations associated with specific outgroup members and ingroup-outgroup interactions, and result in what we call *episodic* or *individual-level* responses; (2) episodic/individual-level cognitions, affect, emotions, and evaluations form the basis of

relatively context-free and time-free cognitive, affective, emotional, and evaluative responses towards, and expectations about, the outgroup *as a whole* and ingroup-outgroup interactions *in general*—what we call *chronic*, or *group-level responses*; (3) chronic/group-level responses shape, in turn, episodic/individual-level responses; that is, expectations about the outgroup as a whole and ingroup-outgroup interactions in general, affect responses to specific outgroup members and ingroup-outgroup interactions; (4) this feedback effect linking episodic/individual-level responses to chronic/group-level responses [*inductive learning* or individual-to-group generalization], and feed-forward effect linking chronic/group level responses to episodic/individual-level responses [*deductive learning* or group-to-individual generalization], form a dynamic loop that is repeated continually as experience with the outgroup accumulates throughout one's lifetime; (5) both episodic/individual-level and chronic/group-level responses to the outgroup change over the lifespan through reciprocal interaction, and the accumulation of repeated and diverse episodic contact experiences, reflecting individuals' unique histories and intergroup contexts' unique ecologies.

We first introduced the distinction between episodic/individual-level and chronic/group-level responses in an earlier paper (Paolini et al., 2006; see also Page-Gould et al., 2008; Paolini, 2008). Here, we extend it further to encompass affect, emotions, cognitions, and evaluations. Consequently, we use the labels *episodic* and *individual-level* variables interchangeably to refer to state and context specific variables tapping onto affective, emotive, cognitive, evaluative responses to *specific* outgroup members in *specific* ingroup-outgroup interactions (e.g., episodic intergroup anxiety coded as 'I' in Table 1). We use the labels '*chronic*' and '*group-level*' variables to refer to more enduring, trait-like and relatively context-free variables, tapping onto affective, emotive, cognitive, evaluative responses to the outgroup as a whole and their members more generally and measured *without* reference to a specific intergroup encounter (e.g., chronic intergroup anxiety coded as 'G' in Table 1).

Principles (2) and (3) posit explicit links between episodic/individual-level responses and chronic/group-level responses. We suggest that these links are underpinned by two distinct forms of

generalization relevant to intergroup contact experiences, namely inductive and deductive learning. In social psychology, inductive learning is often called individual-to-group (Brown & Hewstone, 2005) or member-to-group generalization (Paolini, Hewstone, Rubin, & Pay, 2004b; Stark, Flache, & Veenstra, 2013). Generalization of cognitions are typically the domain of stereotype change researchers (e.g., McIntyre, Paolini, & Hewstone, 2014; Paolini et al., 2004b). Intergroup contact researchers have traditionally focused on generalization of evaluations and global affect (for a discussion, Pettigrew & Tropp, 2011; Stark et al., 2013), but recently started to consider generalization of specific emotions (e.g., empathy, anxiety; Paolini et al, 2006; Paolini et al., 2010; Stephan, 2014). Similarly, we call deductive learning, going from chronic/group-level responses to episodic/individual-level responses, group-to-member or group-to-individual generalizations (Wilder & Shapiro, 1991), which also potentially take place at the level of evaluations, specific emotions, cognitions and affect.

A Model of Anxiety Learning in Interactions with the Outgroup

When applied to intergroup anxiety, the five organizing principles described above take the shape of the model depicted in Figure 2. Central to our time-integrated model of anxiety learning, Figure 2 illustrates the temporal integration of chronic and episodic anxiety including the inductive feed-back and the deductive feed-forward links. Figure 2 also illustrates how episodic anxiety is generated by a specific, discrete experience of contact ('episodic contact') with outgroup members. In contrast, chronic anxiety takes its source in individuals' cumulative past history of contact with the outgroup (or simply, cumulative contact or 'CC' in figure).

--INSERT FIGURE 2 HERE--

Critically, we do not simply argue that episodic/individual-level processes and chronic/group-level processes should both be taken into consideration and measured. Rather, this anxiety learning model explains how episodic/individual-level processes and chronic/group-level processes *interact* to determine individuals' net anxiety responses: It guides us in advancing specific predictions for these interactions, identifying emerging evidence relevant to testing these predictions, and understanding

where further research is needed. Figure 2 illustrates some of this emerging complexity (see next section). For example, it shows how chronic anxiety and outgroup prejudice moderate inductive and deductive learning links, respectively.

There are several key differences between our anxiety learning model and Blascovich and Tomaka's (1996) biopsychosocial model (BPSM) of challenge and threat. Firstly, the BPSM focuses most heavily on acute/episodic anxiety responses (i.e., episodic contact-anxiety links), whereas our learning model incorporates the impact that cumulative experiences of contact with the outgroup possibly exert on chronic and episodic anxiety responses (i.e., cumulative contact-anxiety links). Hence, even though the BPSM can be made to incorporate the effects of chronic anxiety responses by considering cumulative intergroup contact experiences as one of the resources individuals bring to episodic encounters, the BPSM's analysis of task demands is heavily weighted (but not exclusively generated) by episodic (i.e., task-specific) resources.

In contrast, our learning model of intergroup anxiety advocates more explicitly the dynamic interaction between, and delves more deeply into, episodic *and* chronic experiences interacting over time. As such, it frames the acute anxiety responses of the BPSM in a more complex manner, which includes both acute *and* chronic anxiety and their interaction over time. Consequently, our model is unique in explicitly addressing processes of generalization, linking episodic anxiety responses to more chronic, generalized anxiety responses, and in highlighting potential mechanisms and moderators of these processes. Thus, our model brings to the forefront the mutual dynamic interplay of both acute and chronic anxiety responses over time.

This temporally dynamic outlook to intergroup anxiety raises potential complexities and dissociations that are difficult to conceive from more static outlooks of intergroup anxiety and contact. The next section clarifies how our learning model of anxiety is consistent with emerging psychophysiological and behavioral evidence for the contact-anxiety link.

The Interplay Between Episodic and Chronic Intergroup Anxiety:

Emerging Evidence and Directions for Future Research

Traditional research on anxiety in intergroup contact has failed to appreciate the complex and time-dependent interplay between episodic and chronic anxiety as individuals' experiences with outgroups accumulate over the lifespan (Paolini, 2008; Paolini et al., 2006). However, since Blascovich and colleagues' (2001) groundbreaking work, time-bound analyses of intergroup anxiety and stress have started to thrive. Advancements in unobtrusive, on-line, psycho-physiological measurements of anxiety have revolutionized our understanding of episodic anxiety—including galvanic skin responses, heart reactivity, cortisol release, etc. (see Guglielmi, 1999). Moreover, a growing use of time-sensitive research paradigms—including conditioning paradigms, cortisol release monitoring, and diary methods—make it possible to explore the processes that bridge episodic and chronic anxiety and their dynamic interplay.

In this section, we dissect these emerging research outcomes using our model of anxiety learning. We start by discussing the limited research on anxiety learning (i.e., Figure 2's link from 'episodic contact' to 'episodic anxiety', and the contingency-bound learning loop) and inductive anxiety learning (i.e., Figure 2's link from 'episodic anxiety' to 'chronic anxiety'), and then move onto more extensive work on deductive anxiety learning (i.e., Figure 2's link from 'chronic anxiety' to 'episodic anxiety') and its key moderators (see diamonds on that link). Throughout, we advance untested predictions and provide ideas for new research.

Initial Evidence for Intergroup Anxiety Learning

The strong emphasis on remedial intergroup interventions in social psychology has to date unduly constrained the scope of intergroup contact research to investigations on intergroup anxiety *reductions* (e.g. Paolini et al., 2004a, 2007; Turner et al., 2007). For a fuller understanding of the dynamic interplay between episodic and chronic anxiety, we cannot avoid investigating the conditions under which anxiety both *increases*, and *decreases*.

Olsson and colleagues (Olsson, Ebert, Banaji, & Phelps, 2005) have recently broken with the tradition of studying anxiety reductions. They used an aversive conditioning procedure to examine the stimulus-specific acquisition and extinction of intergroup anxiety ('contingency-bound learning' in Figure 2)⁵. They presented White and Black participants with two White and two Black faces and repeatedly paired one of each with a mild electric shock, and another of each with no shock. Following aversive conditioning, participants underwent extinction: faces were presented repeatedly without any shocks. Results revealed that participants acquired anxiety responses towards the ingroup and outgroup faces paired with shock relative to the faces not paired with shock; however, learnt anxiety responses towards the outgroup (vs. ingroup) extinguished more slowly. Olsson et al. interpreted their findings within an evolutionary framework of learning preparedness, whereby outgroups constitute evolutionarily fear-relevant stimuli that are more strongly associated with fear, like spiders and snakes (Ohman & Mineka, 2001). From a learning outlook, these findings demonstrate that Pavlovian conditioning contributes to the first-hand learning of outgroup anxiety and suggest that outgroups are slower to be *dis*-associated from anxiety.

Our research extends Olsson et al.'s analysis to conditions in which we learn to become anxious of outgroups *second-hand* by observing others (Harris, Griffin, & Paolini, 2014a; Harris, Paolini, & Griffin, 2014b). Like Olsson et al., White Australian participants learnt to respond anxiously to the outgroup by experiencing pairings of a Black face and a mild electrical stimulation (i.e., 'first-hand' contingency-bound learning). In a second experimental condition, participants instead watched a video of a White individual receiving face-shock pairings and appearing uncomfortable when one Black face was presented, and relaxed when another Black face appeared (i.e., 'second-hand' contingency-bound learning). We found that skin conductance responses displayed similar levels of anxiety acquisition for both learning conditions.

This behavioral evidence for direct and observational learning of anxiety in the intergroup domain (Harris et al., 2014a) contributes to recent neurophysiological and imaging data suggesting an

overlap in the neural circuits in direct and vicarious fear learning (Olsson, Nearing & Phelps, 2007). This evidence suggests that people not only learn to feel comfortable and respond positively to outgroups by directly witnessing positive ingroup-outgroup interactions (Mazziotta et al., 2011; Paolini et al., 2004a, 2007; Turner et al., 2007; Wright, Aron, McLaughlin-Volpe, & Ropp, 1997). The same mechanisms of observational and vicarious learning are also involved when experiencing negative intergroup interactions (Weisbuch, Pauker, & Ambady, 2009), thus, helping explain how people become anxious and learn to respond negatively to outgroups in the first place.

Initial Evidence for Inductive Anxiety Learning

Our research on observational learning of outgroup anxiety has also contributed to understanding the processes that underpin inductive anxiety learning or individual-to-group generalization (Harris et al., 2014b)—the link going from ‘episodic anxiety’ and ‘chronic anxiety’ in Figure 2. We explored how episodic anxiety generalizes from outgroup members directly involved in the aversive contact experience (e.g., paired with the shock) to outgroup members not directly involved. For this, we used a face morphing software and generated progressively less outgroup-like variations of our target faces, as well as new faces of comparable “Black-ness”. We found that episodic anxiety generalized along a similarity-dissimilarity gradient: Intergroup anxiety generalized to Black faces that were configurally most similar (vs. dissimilar) to the target Black faces.

Importantly, social and intergroup dimensions of the observational learning experience played a key role in the amplitude of these generalization effects. The generalization effects were more pronounced among individuals from an ethnic minority (Asian Australians vs. White Australians) and when learning to become anxious from a majority model (White vs. Asian model). Moreover, perceived model believability and self-model similarity mediated these effects, confirming the need to embed any test of *intergroup* anxiety learning into the social and intergroup context in which these phenomena take place.

A sophisticated understanding of the processes conducive to generalization is essential to managing intergroup relations; psycho-physiological and behavioral research is scant in this area and more work is needed. Because of individual-to-group and group-to-individual generalization (i.e., inductive and deductive learning), discrete negative and positive experiences with the outgroup have far-reaching consequences on future intergroup interactions and on intergroup relations. Similarly, because of these generalization processes, positive intergroup contact is a legitimate intervention tool to improve intergroup experiences, responses of individuals and entire groups (Brown & Hewstone, 2005; Pettigrew & Tropp, 2006, 2011). Without generalizations, interventions fostering positive intergroup contact are limited to specific contact experiences with specific outgroup members and any improvements in response to whole outgroups cannot reverberate back to other individual outgroup members and future ingroup-outgroup interactions. Hence, we call for more research in this area.

Possible Moderation by Category Salience

Tests of moderation provide a way to improve our understanding of generalization of anxiety and there are important lessons to be learnt from existing evidence: Positive generalized changes in chronic/group-level *evaluations* and *cognitions* can be achieved after contact (Pettigrew & Tropp, 2006, 2011), facilitated by positive contact and high category salience, or awareness of the ingroup-outgroup category distinction (for a review, Brown & Hewstone, 2005). Hence, consistent with classic cognitive analyses of generalization (Rothbart & John, 1985; Rothbart, Sriram, & Davis-Stitt, 1996), for successful individual-to-group generalization, the contact partners must see themselves as representatives or typical of their group, and the contact experience as an 'intergroup' (vs. interpersonal) interaction.

Whereas the above research dealt with generalization of evaluations and cognitions, category salience may play a similar moderating role in inductive learning of emotions, and, in particular, of anxiety (see CS diamond on the link from episodic anxiety to chronic anxiety in Figure 2), an idea contemplated by Eliot Smith (1993):

Suppose almost every encounter with a group member leads to similar emotions, and that *the ingroup-outgroup distinction is so salient* that the outgroup is viewed as quite homogeneous (...). Then the perceiver would end up reacting in the same way to just about any outgroup member (Smith, 1993, p. 305; emphasis added).

We found initial evidence supporting Smith's contention in our work and that of research collaborators (see Paolini et al., 2006): Individuals more aware of their group memberships during contact displayed larger anxiety reductions after individual (Harwood, Hewstone, Paolini, & Voci, 2005, Study 2) or repeated positive contact experiences with individual outgroup members (Voci & Hewstone, 2003a, 2003b). Alternatively, those who were less aware of their group membership during contact exhibited poor (Harwood et al., 2005, Study 2; Voci & Hewstone, 2003a, Study 1) or no anxiety-reductions after contact (Voci & Hewstone, 2003a, Study 2; Voci & Hewstone, 2003b, Study 1). Hence, preliminary evidence suggests that category salience is a catalyst for anxiety reductions following positive contact.

Evidence suggests that category salience may play a stronger moderating role in anxiety *increases* (vs. decreases) after negative contact experiences. Recent research has shown that category salience is higher when contact goes badly (Paolini et al., 2010; 2014). The implications of these valence-salience effects are poignant as they suggest that generalizations of negative consequences after negative contact may be comparably larger and more robust than generalizations of positive consequences after positive contact. We have published contact data confirming that asymmetries in generalization may occur for evaluations (Barlow et al., 2012; Graf et al., 2014; however, cf. Stark et al., 2013), and future research should investigate whether these also hold for intergroup anxiety.

Evidence of Deductive Anxiety Learning

While research on the mechanisms of contingency-bound anxiety learning and inductive anxiety learning is still scant, evidence of deductive anxiety learning—i.e., group-to-individual generalization—is growing faster (see Table 2). In Figure 2, we represent deductive learning by

connecting chronic anxiety ('CA') to the episodic contact-episodic anxiety link; depicted in this way, chronic anxiety moderates anxiety produced by episodic contact. In addition, we superimpose several chronic/group level moderator variables on the deductive learning link (see diamonds on deductive learning link in Figure 2) to show that these may moderate deductive learning, and hence the anxiety produced by episodic contact. Finally, chronic anxiety might moderate changes in anxiety as a consequence of the contact experience, as depicted by the diamond on the contingency-bound learning link in Figure 2.

--INSERT TABLE 2 HERE--

Moderation by Chronic Anxiety

Based on our organizing principles and learning model of anxiety, chronic/group-level anxiety should moderate (1) episodic/individual-level anxiety and (2) contingency-bound anxiety learning (Fig. 2) (see also Page-Gould et al., 2008). Consistent with the first prediction, Ofan, Rubin, and Amodio (2013) found that individuals' chronic social anxiety and situationally-induced intergroup anxiety moderated participants' attendance of interethnic differences—a key cognitive precursor of intergroup threat responses—as measured by the N170 component of brain event related potentials; a difference in N170 between White and Black faces appeared only among those high (vs. low) in dispositional social anxiety being monitored by the experimenter “for signs of prejudice” (a ‘public’ or ‘audience’ condition).

Consistent with the second prediction, we found evidence suggesting that chronic intergroup anxiety moderates stimulus specific *increases* in episodic anxiety (i.e., anxiety learning) following direct and observational aversive conditioning of interethnic anxiety (Harris et al., 2014a). White Australians' chronic anxiety towards Black people *in general* (i.e., chronic anxiety) moderated the acquisition of intergroup anxiety, such that galvanic skin responses to the faces paired with shock were larger among those who reported a high chronic anxiety towards Black people than among those who were less

chronically anxious, among both direct and observational learning participants. Hence, chronic anxiety was a catalyst of anxiety learning across both direct, and vicarious anxiety learning.

While the above research shows that chronic anxiety moderates acute anxiety responses and stimulus-specific learning of acute anxiety, recent work by Trawalter and colleagues (2012) demonstrates that chronic anxiety *at the onset* moderates also the *development* of chronic anxiety over time (i.e., chronic anxiety as the end point or outcome of inductive anxiety learning; for simplicity this effect is omitted in Figure 2). Using a diary method to monitor daily intergroup contact of college students, the researchers took repeated measurements of cortisol release to assess healthy and unhealthy stress responses following contact. They found that the proportion of intergroup contact that participants reported having had the previous day predicted the amplitude of cortisol boosts the following day, suggesting that *all* participants experienced intergroup exchanges as stressful and requiring the mobilizing of extra resources. However, chronic intergroup anxiety—operationalized as concerns about appearing prejudiced—moderated the long term outlook of these cortisol boosts (i.e., chronic anxiety as outcome). Over the academic year, individuals initially low in chronic intergroup anxiety showed a steepening of cortisol diurnal rhythms following increases in interethnic contact, indicative of healthy chronic stress responses and increased resilience over time. However, individuals initially high in chronic intergroup anxiety showed a progressive flattening of cortisol slopes, indicative of chronic ill health and stress. The findings indicate that chronic anxiety increases the attendance of threat related cues, accelerates the acquisition of episodic intergroup anxiety and leads to the establishment of chronic stress responses.

However, chronic anxiety is not necessarily a predictor of negative outcomes; rather it may act more generally as an amplifier of episodic anxiety responses and anxiety learning in both increasing and decreasing directions. Page-Gould, Mendoza-Denton and Tropp (2008) measured acute stress responses as intergroup friendships between White and Latino/a college students across three sessions. Declines in cortisol reactivity as friendships developed were observed exclusively among

participants high in race-sensitivity, another variant of chronic intergroup anxiety (Mendoza-Denton et al., 2008), or among individuals high in implicit race prejudice. These results indicate that chronic intergroup anxiety can act as the catalyst of both positive and negative changes in anxiety.

Moderation by Outgroup Prejudice

Individual difference variables highly correlated with chronic intergroup anxiety may mimic the potentially complex and dissociated moderating effects we discussed earlier for chronic anxiety (see e.g., Mendes & Koslov, 2012; see the moderation outgroup prejudice ('OP') diamond for outgroup prejudice in Figure 2). Westie and De Fleur's (1959) pioneering study on the physiology of intergroup relations exposed the anxiety exacerbating effects of prejudice. They found that prejudiced individuals displayed higher skin conductance responses to Black than White photographs, whereas non-prejudiced individuals did not.

Importantly, as Westie and De Fleur's (1969) participant groups had been carefully matched along a variety of social demographics (age, sex, social class, residential history), including *previous contact with Black people*, demonstrating that the higher anxiety of the prejudiced group was driven by differences in prejudice. A recent study by Mendes and colleagues (2007b) demonstrates that prejudice may also be associated with *fewer positive* outcomes. When monitoring acute neuroendocrine stress responses during a stressful task performed in front of a White vs. Black evaluator, Mendes et al. found that all intergroup and intragroup participants displayed a similar pattern of malignant stress responses (catabolic/cortisol releases) to the stressful task, irrespective of their implicit race prejudice on a race IAT. Implicit prejudice, however, moderated the presentation of the benignant stress counterpart (anabolic/protective responses): Those allocated to the Black evaluator and who were higher on implicit prejudice did *not* display the salutary stress responses displayed by those allocated to the Black evaluator and low in implicit prejudice, suggesting that prejudiced individuals suffer from both the presence of malignant intergroup stress and the *lack of* benignant intergroup stress.

The outlook of moderation by prejudice is however not necessarily bleak. As indicated earlier, in Page-Gould et al.'s (2008) experimental study of intergroup friendship formation, it was *only* those who had scored high (vs. low) on implicit race prejudice (or race-sensitivity) at pre-test, who (a) displayed significant declines in cortisol release as intergroup friendship developed, (b) showed reduced anxious mood on the days in which they engaged in intergroup interactions, and (c) reported more self-initiated intergroup interactions. Hence, while prejudiced individuals might suffer from higher anxiety levels, there is evidence that they benefit the most from prejudice and anxiety reduction interventions (for more data, see Hodson, 2011).

Moderation by Prior Outgroup Contact

As we move outward from the core of our anxiety learning model, we expect individuals' past outgroup contact to play a key moderating role (see Figure 2's moderation diamond for cumulative contact on the deductive learning link). We found growing evidence that individuals' histories of *positive* outgroup contact protect against intergroup anxiety and intergroup anxiety learning. As discussed earlier, Blascovich and colleagues (2001, Study 3) measured the amount of quality outgroup contact non-Black participants had with Black people before attending their lab session (e.g., 'how much contact have you had with African-Americans as close friends?', p. 261). This study found reduced and, at times, no evidence of cardiovascular threat responses during interactions with a Black confederate among those participants who had a history of extensive and positive outgroup contact. Similarly, we measured participants' pre-test levels of quality contact with Black people (e.g., 'thinking about the past interactions you have had with Black people, are most interactions pleasant?') and found that this chronic variable buffered against the stimulus-specific *acquisition* of outgroup anxiety during both a direct and an observational aversive conditioning procedure (Harris et al., 2014a). Hence, White individuals with histories of positive contact with Black people were less likely to learn to become anxious of Black faces when faced with negative outgroup experiences.

Extending this reasoning, Olsson and colleagues (2005) checked the moderating effects of prior outgroup contact on the *extinction* of intergroup anxiety, as acquired during a direct aversive conditioning procedure. At pre-test, they measured the number of interracial dates as a proxy of prior quality contact with Black people, and found a significant negative correlation with the number of times a Black (vs. White) face needed to be presented without shock to reduce participants' heightened arousal. Hence, the more past quality contact participants had with the outgroup, the faster they recovered physiologically from an aversive intergroup experience.

Results from a diary study by Page-Gould (2012) shed some initial light on the processes contributing to the anxiety buffering effects of intimate intergroup contact. Page-Gould found that individuals who had a relatively broad and intimate network of intergroup friends were more likely to initiate (vs. avoid) new intergroup interactions following interpersonal conflict with an outgroup member—an obviously anxiety-provoking experience; whereas individuals with fewer intergroup friends were more likely to avoid outgroup members altogether after conflict. Mediation tests revealed that the network of intergroup friends buffered against the contact avoidance effects of interpersonal conflict with outgroup members by offering (intergroup) social support post-conflict.

To summarize, there is growing and convincing evidence that positive prior contact shapes anxiety learning and mitigates a variety of negative outcomes in ways consistent with our model (Figure 2): It buffers against anxiety experienced during intergroup exchanges, mitigates the development of intergroup anxiety following aversive first-hand and observational intergroup contact, accelerates return to normality after heightened intergroup anxiety and encourages outgroup approach (vs. avoidance).

Altogether this evidence advances our understanding of how *past* contact with the outgroup shapes the presentation of anxiety during intergroup contact in the *present* and *over time*. Yet, there are at least three areas where more research is needed.

First, future research should test the moderating effects of individuals' *negative* histories of past contact. Intergroup contact research has been criticized for a focus on positive contact experiences and

a neglect of sub-optimal and negative contact (see Paolini et al., 2010; Pettigrew, 2008; Pettigrew & Tropp, 2011). This critique extends to extant tests of moderation. Future research should test the robustness and invariance of the buffering effects discussed earlier and ascertain the extent to which these beneficial effects are restricted to cumulative positive experiences with the outgroup, like those associated with intergroup friendship and intergroup dating. Histories of negative intergroup contact, like those more frequently experienced in conflict areas (e.g., Northern Ireland, Cyprus, South Africa, etc.), should result in diametrically opposite outcomes. Rather than buffering, they should exacerbate anxiety responses and anxiety learning, and increase the amplitude of inductive and/or deductive generalization effects, possibly through their associations with chronic anxiety.

Hence, we call for replications of Blascovich et al., Harris et al., and Olsson et al. in contexts where reasonable variations in past contact quality—positive *and negative*—are observed and can be measured. Experimental analogues of these field tests could involve *priming* or remembering positive vs. negative experiences of outgroup contact (e.g., through a biographical recall task) *prior* to the implementation of aversive vs. appetitive conditioning procedures. The implications of these predicted dissociations in anxiety learning along positive vs. negative chronic moderators are important. These dissociations would imply that new ingroup-outgroup interactions are most likely to *confirm* (vs. *disconfirm*), pre-existing expectations about the *typical* ingroup-outgroup interaction, thus, leading to a negative or positive spiraling of intergroup relations where expectations are already negative or positive, respectively.

Second, moderation evidence relies on indices that incorporate both quality and quantity of past outgroup contact such as *number* of intergroup *friendships* or intergroup dates (Allport, 1954; see e.g., Brown, Maras, Masser, Vivian, & Hewstone, 2001; Voci & Hewstone, 2003a). As a result, it is unclear whether the effects of these chronic variables are driven by valence of past ingroup-outgroup interactions, by their number, or by an interaction between the two. Knowing this is key to intervention designing (Paolini et al., 2006). Based on human and animal learning research (Kent, 1997; Lubow,

1998; Mineka & Cook, 1986), there may be more scope to change (increase/decrease) anxiety early in one's experience with the outgroup. Hence, contact quantity *in its own right* might have a unique effect on learning trajectories during contact. This idea is consistent with putative mechanisms of moderation advanced by Blascovich (e.g., Blascovich et al., 2001; Mendes et al., 2002) whereby contact quantity decreases anxiety and limits anxiety learning because it increases perceived control, reduces perceived uncertainty about future ingroup-outgroup interactions, and leads to increased intergroup self-efficacy (for a similar point, see Olsson et al., 2005; Plant & Devine, 2003). Because of decreasing uncertainty about the outcome of intergroup contact as contact quantity increases, we also advanced the possibility that the quality of discrete contact experiences might matter more at early stages of outgroup acquaintance (see Paolini et al., 2006 for predictions drawn from the mere exposure literature).

More generally and more importantly, the psychological underpinnings of moderation by chronic variables, as detected so far and discussed above, are interesting but remain substantially untested conjectures (for an isolated notable exception, Page-Gould, 2012). Hence, as evidence of moderation grows, we must learn more about the exact mechanisms that chronic variables—like chronic anxiety, outgroup prejudice, prior contact quantity and quality—recruit as the individuals' experience of contact with the outgroup evolves over time. This, we believe, is where the challenges of future research lie and future research should concentrate.

Summary and Conclusions

Past contact research has failed to look at the dynamic interplay between episodic and chronic intergroup anxiety and, as a consequence, has returned a static and selective understanding of intergroup contact effects (Paolini, 2008). In 2006, we located around 30 studies of intergroup anxiety in intergroup contact (Paolini et al., 2006), with the evidence reflecting a sharp research disconnect between experimental tests isolating the anxiety-provoking effects of episodic contact and correlational tests isolating the anxiety-reducing effects of cumulative outgroup contact. In this article, we explained

how these two usually separate traditions were bridged for the first time in a single design by Blascovich and colleagues' (2001) ground-breaking research.

In this article, we built up on our early analysis and review of evidence: We argued the need for a learning model of anxiety and stress responses during ingroup-outgroup interactions, encompassing both episodic and chronic anxiety towards the outgroup and their interactions, to provide a temporal integration of intergroup contact effects over the lifespan. With this learning outlook in mind, we documented and discussed recent empirical advancements.

Very recent psychophysiological and behavioral investigations of intergroup anxiety by prominent intergroup contact researchers—like, among others, Blascovich, Mendes, Mendoza-Denton, Page-Gould, Richeson, Shelton, and Trawalter—as well as clever extensions of conditioning paradigms to the intergroup domain—e.g., by Olsson, Phelps, Harris, Griffin, and Paolini—all share a common learning framework; we made this explicit, here, in terms of five organizing principles. This research is, in our view, revolutionary and paradigm-shifting since it investigates how cumulative outgroup contact and chronic responses to the outgroup equip the individual for new contact encounters and shape, for better or worse, their episodic responses to the outgroup. In so doing, these studies look at multiple segments of a complex and time-bound learning process of anxiety and reveal a non-linear and dynamic outlook of contact effects.

A model that incorporates both episodic and chronic process variables, as well as their dynamic interplay, has significant theoretical and empirical merits. Theoretically, it is sufficiently flexible and broad to potentially accommodate a disparate number of process variables (e.g., emotions, affect, evaluations and cognitions). Empirically, it helps reconcile mixed and complex contact evidence, as well as formulate new and untested predictions. From a more pragmatic point of view, it provides a stronger and more powerful platform to predict changes in intergroup relationships over time.

We must recognize, however, that the methodological and analytical costs of testing learning models of contact as we define them here are not small: These advantages can be fully enjoyed only if

both episodic and chronic measures of key process variables are included in the research design and if the latter allows for repeated assessments of these variables over time and as individuals' experience with the outgroup grows.

It is worth noting that we have provided a limited discussion of longitudinal contact research because, while longitudinal tests of intergroup contact effects have recently flourished (see e.g., Brown et al., 2007; Christ et al., 2010, 2014; Tropp et al., 2012; see also recent symposium by Gonzalez and Tropp, 2014), only some of these tests have included measures of intergroup anxiety (Binder et al., 2009; Eller & Abrams, 2003, 2004; Levin et al., 2003; Swart et al., 2011). Furthermore, only one study (Page-Gould et al., 2008) fits the physiologically-centered inclusion criteria for our review of new generation research and thus was described in detail. Longitudinal designs have the potential to contribute to our analysis of complex dynamic changes in intergroup anxiety over the time-course and to be instrumental in testing our anxiety learning model. Yet, those studies currently available offer limited insight in the complexities discussed therein as they have been driven by either a focus on cross-lagged relationships between contact and anxiety (Binder et al., 2009; Eller & Abrams, 2003, 2004; Levin et al., 2003) or more recently by a focus on cross-lagged relationships between anxiety and other mediators of contact-prejudice links (see e.g., Swart et al. 2011 for longitudinal links between anxiety and empathy). Hence, even in investigations where changes in anxiety (episodic and/or chronic) over time could have been explored, these changes were either not investigated, or were reported for the sole purpose of ascertaining construct stability over time or establishing baseline model estimates (see e.g. Swart et al.'s, 2011 discussion of imposed load equivalence in auto-regressive models of anxiety).

Conditional growth curve modelling—via multi-level or SEM—is a promising alternative to past approaches to the modelling of longitudinal anxiety data. This powerful and flexible analytical approach can significantly advance our understanding of the dynamics of intergroup anxiety over the individual's life-span by surpassing traditional approaches in important ways (see Christ & Wagner, 2012; Curran,

Obeidat, & Losardo, 2010): Once optimal baseline anxiety growth models are established (i.e., functional forms of the anxiety trajectories over time), these growth models can be expanded to include one or more predictor(s) of growth; the chronic variables we discussed in this article (e.g., chronic anxiety, outgroup prejudice, accumulated past contact). Critically for the dynamics at stake in our anxiety learning model, these predictors can be treated analytically as time-invariant (i.e., not changing over time), or as time-varying covariates (i.e., as themselves changeable over time). The former type of predictor is the kind involved in traditional moderation analysis, whereby stable or invariant characteristics of the individual or experimental treatments are used to predict lower (vs. higher) starting points in the outcome (i.e., anxiety intercepts) and/or steeper (vs. flatter) rates of change over time (i.e., anxiety slopes). Analyses with time-varying predictors, instead, assume that any given repeated measure of anxiety at any point in time is jointly determined by the underlying growth factors (i.e., the autoregressive component) and the impact of the time varying (chronic) covariate at that time period. This means that conditional growth models that include time varying chronic variable predictors can be expanded to incorporate changes in these chronic variables over time, and changes in the magnitude of their effects over time, as well as interactions between multiple covariates over time (for an extensive and accessible discussion, Christ & Wagner, 2012). As such, we believe that this type of model is the way of the future in testing the dynamic and complex interplay between episodic and chronic anxiety (as well as other concurrent and potentially interacting learning processes involving other intergroup emotions, cognitions, and evaluations) over an individual's lifespan.

To conclude, in advancing our learning outlook to intergroup contact effects, we argued that five broad learning principles—about the time-course of affect, emotions, cognitions and evaluations in ingroup-outgroup interactions—implicitly underpin large sections of contemporary intergroup research. We pointed out that while testable, these learning principles most often remain 'assumed' and 'untested' (hence, *meta-theoretical* principles). Yet, recruiting and expanding on these broad learning principles allowed us to develop a more narrow, fully testable model of anxiety learning during ingroup-

outgroup interactions; a learning model that is gaining some traction and is accruing significant amounts of supporting evidence. We advise that this transition from a meta-theoretical learning framework to a testable learning model is not restricted to intergroup anxiety; as it is possible, and indeed, desirable in parallel areas of intergroup research. Ultimately, we hope that the learning framework we advanced here may provide a theoretically unifying umbrella that encompasses models and evidence from *within* the contact literature, as well as from outside the contact literature (e.g., stereotyping, attitudes, evaluative conditioning, etc.). As, in our view, the next level of complexity in analyses of contact effects over time will most likely require the integration of what we know from these traditionally separate research areas, towards the investigation of even higher order interactions between learning of affect, emotions, cognitions *and* evaluations over time. We hope that our present analysis assists intergroup researchers in the first steps of the research endeavors that lie ahead.

References

References marked with an asterisk indicate studies included in the meta-analysis.

Allport, G. W. (1954). *The nature of prejudice*. Cambridge, MA: Addison-Wesley.

*Amodio, D. M. (2009). Intergroup anxiety effects on the control of racial stereotypes: A psychoneuroendocrine analysis. *Journal of Experimental Social Psychology, 45*(1), 60–67.
doi:10.1016/j.jesp.2008.08.009

*Amodio, D. M., & Hamilton, H. K. (2012). Intergroup anxiety effects on implicit racial evaluation and stereotyping. *Emotion, 12*(6), 1273–1280. doi:10.1037/a0029016

Barlow, F. K., Paolini, S., Pedersen, A., Hornsey, M. J., Radke, H. R., Harwood, J., Rubin, M., & Sibley, C. G. (2012). The contact caveat: Negative contact predicts increased prejudice more than positive contact predicts reduced prejudice. *Personality and Social Psychology Bulletin, 38*(12), 1629-1643.

Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of General Psychology, 5*(4), 323-370.

*Bijleveld, E., Scheepers, D., & Ellemers, N. (2012). The cortisol response to anticipated intergroup interactions predicts self-reported prejudice. *PloS one, 7*(3), e33681.
doi:10.1371/journal.pone.0033681

Binder, J., Zagefka, H., Brown, R., Funke, F., Kessler, T., Mummendey, A., ... & Leyens, J. P. (2009). Does contact reduce prejudice or does prejudice reduce contact? A longitudinal test of the contact hypothesis among majority and minority groups in three European countries. *Journal of personality and social psychology, 96*(4), 843-856.

Bizman, A., & Yinon, Y. (2001). Intergroup and interpersonal threats as determinants of prejudice: The moderating role of in-group identification. *Basic and Applied Social Psychology, 23*, 191-196.

Blascovich, J., & Mendes, W. B. (2010). Social psychophysiology and embodiment. In S. T. Fiske, D. T.

- Gilbert, & G. Lindzey (Ed.), *Handbook of social psychology* (pp. 194-227). Wiley & sons.
- Blascovich, J., Mendes, W. B., Hunter, S. B., & Lickel, B. (2000). Stigma, threat, and social interaction. In T. F. Heatherton, M. R. Hebl, & J. G. Hull (Eds.), *The social psychology of stigma* (pp. 307-333). New York: Guilford.
- *Blascovich, J., Mendes, W. B., Hunter, S. B., Lickel, B., & Kowai-Bell, N. (2001). Perceiver threat in social interactions with stigmatized others. *Journal of Personality and Social Psychology*, 80, 253–267.
- Blascovich, J., & Tomaka, J. (1996). The biopsychosocial model of arousal regulation. *Advances in Experimental Social Psychology*, 28, 1-51.
- *Brown, L. M., Bradley, M. M., & Lang, P. J. (2006). Affective reactions to pictures of ingroup and outgroup members. *Biological Psychology*, 71(3), 303–11.
doi:10.1016/j.biopsycho.2005.06.003
- Brown, R., Eller, A., Leeds, S., & Stace, K. (2007). Intergroup contact and intergroup attitudes: A longitudinal study. *European Journal of Social Psychology*, 37(4), 692-703.
- Brown, R., & Hewstone, M. (2005). An integrative theory of intergroup contact. *Advances in Experimental Social Psychology*, 37, 255-343.
- Brown, R., Maras, P., Masser, B., Vivian, J., & Hewstone, M. (2001). Life on the ocean wave: Testing some intergroup hypotheses in a naturalistic setting. *Group Processes and Intergroup Relations*, 4, 81-98.
- Christ, O., Hewstone, M., Tausch, N., Wagner, U., Voci, A., Hughes, J., & Cairns, E. (2010). Direct contact as a moderator of extended contact effects: Cross-sectional and longitudinal impact on outgroup attitudes, behavioral intentions, and attitude certainty. *Personality and Social Psychology Bulletin*, 36(12), 1662-1674.
- Christ, O., Schmid, K., Lolliot, S., Swart, H., Stolle, D., Tausch, N., ... & Hewstone, M. (2014). Contextual effect of positive intergroup contact on outgroup prejudice. *Proceedings of the*

National Academy of Sciences, 111(11), 3996-4000.

Christ, O., & Wagner, U. (2012). 10 Methodological issues in the study of intergroup contact. *Advances in Intergroup Contact*, 233.

*Conger, A. J., Dygdon, J. A., & Rollock, D. (2011). Conditioned emotional responses in racial prejudice. *Ethnic and Racial Studies*, 35(2), 1–22. doi:10.1080/01419870.2011.581760

Cottrell, C. A., & Neuberg, S. L. (2005). Different emotional reactions to different groups: A sociofunctional threat-based approach to "prejudice". *Journal of Personality and Social Psychology*, 88(5), 770-789.

Crandall, C. S., & Eshleman, A. (2003). A justification-suppression of the expression and experience of prejudice. *Psychological Bulletin*, 129, 414-446.

Curran, P. J., Obeidat, K., & Losardo, D. (2010). Twelve frequently asked questions about growth curve modeling. *Journal of Cognition and Development*, 11(2), 121-136.

Devine, P. G., Evett, S. R., & Vasquez-Suson, K. A. (1996). Exploring the interpersonal dynamics of intergroup contact. In R. M. Sorrentino & E. T. Higgins (Eds.), *Handbook of motivation and cognition: The interpersonal context* (Vol. 3, pp. 423-464). New York: Guilford Press.

Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: a theoretical integration and synthesis of laboratory research. *Psychological Bulletin*, 130(3), 355-391.

Eller A., & Paolini, S. (2011, July), *Intergroup contact as a learning process: Redefining a classic concept through new lenses*. Symposium held at General Meeting of the European Association of Social Psychologists (EASP), Stockholm.

Eller, A., & Abrams, D. (2003). 'Gringos' in Mexico: Cross-sectional and longitudinal effects of language school-promoted contact on intergroup bias. *Group Processes & Intergroup Relations*, 6(1), 55-75.

- Eller, A., & Abrams, D. (2004). Come together: Longitudinal comparisons of Pettigrew's reformulated intergroup contact model and the common ingroup identity model in Anglo-French and Mexican-American contexts. *European Journal of Social Psychology, 34*(3), 229-256.
- Epel, E. S., McEwen, B. S. & Ickovics, J. I. (1998). Embodying psychological thriving: Physical thriving in response to stress. *Journal of Social Issues, 54* (2), 301-322.
- Esses, V. M., & Dovidio, J. F. (2002). The role of emotions in determining willingness to engage in intergroup contact. *Personality and Social Psychology Bulletin, 28*, 1202-1214.
- Gonzalez, R., & Tropp, L. (2014). *Testing longitudinal models of intergroup contact in diverse contexts*. Symposium presented at the 17th General Meeting of the EASP, Amsterdam, Netherlands.
- Graf, S., Paolini, S., & Rubin, M. (in press). Negative intergroup contact is more influential, but positive intergroup contact is more common: An ecological assessment of contact prominence and contact prevalence in five Central European countries. *European Journal of Social Psychology*.
- *Gray, H. M., Mendes, W. B., & Denny-Brown, C. (2008). An in-group advantage in detecting intergroup anxiety. *Psychological Science, 19*(12), 1233–1237. doi:10.1111/j.1467-9280.2008.02230.x
- Greenland, K., & Brown, R. (1999). Categorization and intergroup anxiety in contact between British and Japanese nationals. *European Journal of Social Psychology, 29*, 503-521.
- Greenland, K., Masser, B., & Prentice, T. (2001). "They're scared of it": Intergroup determinants of attitudes toward children with HIV. *Journal of Applied Social Psychology, 31*, 2127-2148.
- *Greenland, K., Xenias, D., & Maio, G. (2012). Intergroup anxiety from the self and other: Evidence from self-report, physiological effects, and real interactions. *European Journal of Social Psychology, 42*(2), 150–163. doi:10.1002/ejsp.867
- Guglielmi, R. S. (1999). Psychophysiological assessment of prejudice: Past research, current status, and future directions. *Personality and Social Psychology Review, 3*(2), 123-157.
- Harris, N. C., Griffin, A. S., & Paolini, S. (2014a). Learning about the world from watching others: Vicarious fear learning of outgroups and moderation by prior outgroup contact and chronic

- outgroup anxiety. Manuscript under review, University of Newcastle, Australia.
- Harris, N. C., Paolini, S., & Griffin, A. S. (2014b). Similarity helps: Similarity underpins generalization of inter-ethnic anxiety during aversive observational learning. *Manuscript in preparation*.
- Harwood, J., Hewstone, M., Paolini, S., & Voci, A. (2005) Grandparent-grandchild contact and attitudes towards older adults: Moderator and mediator effects. *Personality and Social Psychology Bulletin*, 31, 393-406.
- Henderson-King, E. I., & Nisbett, R. E. (1996). Anti-black prejudice as a function of exposure to the negative behaviour of a single black person. *Journal of Personality and Social Psychology*, 71, 654-664.
- Hodson, G. (2011). Do ideologically intolerant people benefit from intergroup contact? *Current Directions in Psychological Science*, 20, 154-159.
- Islam, M. R., & Hewstone, M. (1993). Dimensions of contact as predictors of intergroup anxiety, perceived out-group variability, and out-group attitude: An integrative model. *Personality and Social Psychology Bulletin*, 19, 700-710.
- *Jamieson, J. P., Koslov, K., Nock, M. K., & Mendes, W. B. (2013). Experiencing discrimination increases risk taking. *Psychological Science*, 24(2), 131-139.
- Kent, G. (1997). Dental phobias. In G. C. Davey (Ed.), *Phobias: A handbook of theory, research and treatment* (pp. 107–127). Chichester, England: Wiley.
- *Kolk, C. J. V. (1978). Physiological reactions of Black, Puerto Rican, and White students in suggested ethnic encounters. *The Journal of Social Psychology*, 104, 107-114.
- Lang, P. J. (1985). The cognitive psychophysiology of emotion: Fear and anxiety. In A. H. Tuma & J. D. Maser (Eds.), *Anxiety and the anxiety disorders*. Hillsdale, NJ: Lawrence Erlbaum Associates Inc.
- Levin, S., Van Laar, C., & Sidanius, J. (2003). The effects of ingroup and outgroup friendship on ethnic attitudes in college: A longitudinal study. *Group Processes and Intergroup Relations*, 6, 76-92.

- *Littleford, L. N., Wright, M. O. D., & Sayoc-parial, M. (2010). White students' intergroup anxiety during same-race and interracial interactions : A multimethod approach. *Basic and Applied Social Psychology, 27*(1), 37–41.
- Lubow, R. E. (1998). Latent inhibition and behavior pathology: Prophylactic and other possible effects of stimulus preexposure. In W. O'Donohue (Ed.), *Learning and behavior therapy* (pp. 107–121). Needham Heights, MA: Allyn & Bacon.
- Mackie, D. M., Devos, T., & Smith, E. R. (2000). Intergroup emotions: Explaining offensive action tendencies in an intergroup context. *Journal of Personality and Social Psychology, 79*, 602–616.
- *Maio, G. R., Greenland, K., Bernard, M., & Esses, V. M. (2001). Effects of intergroup ambivalence on information processing: The role of physiological arousal. *Group Processes and Intergroup Relations, 4*(4), 355–372. doi:10.1177/1368430201004004005
- *Mallan, K. M., Sax, J., & Lipp, O. V. (2009). Verbal instruction abolishes fear conditioned to racial out-group faces. *Journal of Experimental Social Psychology, 45*(6), 1303–1307. doi:10.1016/j.jesp.2009.08.001
- Mazziotta, A., Mummendey, A., & Wright, S. C. (2011). Vicarious intergroup contact effects Applying social-cognitive theory to intergroup contact research. *Group Processes & Intergroup Relations, 14*(2), 255–274.
- McIntyre, K., Paolini, S., & Hewstone, M. (2014). *Individual-to-group generalization: A meta-analytical review*. Manuscript in preparation, University of Newcastle, Australia.
- *Mendes, W. B., Blascovich, J., Hunter, S. B., Lickel, B., & Jost, J. T. (2007a). Threatened by the unexpected: Physiological responses during social interactions with expectancy-violating partners. *Journal of Personality and Social Psychology, 92*(4), 698–716. doi:10.1037/0022-3514.92.4.698
- *Mendes, W. B., Blascovich, J., Lickel, B., & Hunter, S. (2002). Challenge and threat during social

- interactions with White and Black men. *Personality and Social Psychology Bulletin*, 28(7), 939–952. doi:10.1177/014616720202800707
- *Mendes, W. B., Gray, H. M., Mendoza-denton, R., Major, B., & Epel, E. S. (2007b). Why egalitarianism might be good for your health: Physiological thriving during stressful intergroup encounters. *Psychological Science*, 18(11), 991–998.
- *Mendes, W. B., & Koslov, K. (2012). Brittle smiles: Positive biases toward stigmatized and outgroup targets. *Journal of Experimental Psychology: General*, 142(3), 923–33. doi:10.1037/a0029663
- *Mendes, W. B., Major, B., McCoy, S., & Blascovich, J. (2008). How attributional ambiguity shapes physiological and emotional responses to social rejection and acceptance. *Journal of Personality and Social Psychology*, 94(2), 278–291.
- Mendoza-Denton, R., Pietrzak, J., & Downey, G. (2008). Distinguishing institutional identification from academic goal pursuit: Interactive effects of ethnic identification and race-based rejection sensitivity. *Journal of Personality and Social Psychology*, 95(2), 338–351.
- Mineka, S., & Cook, M. (1986). Immunization against the observational conditioning of snake fear in rhesus monkeys. *Journal of Abnormal Psychology*, 95, 307–318.
- *Navarrete, C. D., McDonald, M. M., Asher, B. D., Kerr, N. L., Yokota, K., Olsson, A., & Sidanius, J. (2012). Fear is readily associated with an out-group face in a minimal group context. *Evolution and Human Behavior*, 33(5), 590–593. doi:10.1016/j.evolhumbehav.2012.02.007
- *Navarrete, C. D., Olsson, A., Ho, A. K., Mendes, W. B., Thomsen, L., & Sidanius, J. (2009). Fear extinction to an out-group face: The role of target gender. *Psychological Science*, 20(2), 155–158. doi:10.1111/j.1467-9280.2009.02273.x
- *Ofan, R. H., Rubin, N., & Amodio, D. M. (2013). Situation-based social anxiety enhances the neural processing of faces: Evidence from an intergroup context. *Social Cognitive and Affective Neuroscience Advance Access*, 9(8), 1055–1061.
- Öhman, A., & Mineka, S. (2001). Fears, phobias, and preparedness: Toward an evolved module of fear

and fear learning. *Psychological Review*, 108(3), 483-522.

*Olsson, A., Ebert, J. P., Banaji, M. R., & Phelps, E. A. (2005). The role of social groups in the persistence of learned fear. *Science*, 309(5735), 785–787. doi:10.1126/science.1113551

Olsson, A., Nearing, K. I., & Phelps, E. A. (2007). Learning fears by observing others: The neural systems of social fear transmission. *SCAN*, 2, 3-11.

*Page-Gould, E. (2012). To whom can I turn? Maintenance of positive intergroup relations in the face of intergroup conflict. *Social Psychological and Personality Science*, 3(4), 462–470.

doi:10.1177/1948550611426937

*Page-Gould, E., Mendes, W. B., & Major, B. (2010). Intergroup contact facilitates physiological recovery following stressful intergroup interactions. *Journal of Experimental Social Psychology*, 46(5), 854–858. doi:10.1016/j.jesp.2010.04.006

*Page-Gould, E., Mendoza-Denton, R., & Tropp, L. R. (2008). With a little help from my cross-group friend: Reducing anxiety in intergroup contexts through cross-group friendship. *Journal of Personality and Social Psychology*, 95(5), 1080–94. doi:10.1037/0022-3514.95.5.1080

Paolini, S. (2008, August). *Testing direct and indirect cross-gender friendship effects experimentally and longitudinally: A close-up on the interplay between episodic and chronic process variables*. Paper presented at the EASP-SPSSI joint meeting on “Intergroup Contact: Recent Advancements in Basic and Applied Research”, Marburg, Germany.

Paolini, S., Harwood, J., & Rubin, M. (2010). Negative intergroup contact makes group memberships salient: Explaining why intergroup conflict endures. *Personality and Social Psychology Bulletin*, 36(12), 1723-1738.

Paolini, S. Harwood, J., Rubin, M., Husnu, S., Joyce, N., & Hewstone, M. (2014). *Positive and extensive intergroup contact in the past buffers against the disproportionate impact of negative contact in the present*. Manuscript under review, University of Newcastle, Australia.

- Paolini, S., Hewstone, M., & Cairns, E. (2007). Direct and indirect intergroup friendship effects: Testing the moderating role of the affective-cognitive bases of prejudice. *Personality and Social Psychology Bulletin*, 33(10), 1406-1420.
- Paolini, S., Hewstone, M., Cairns, E., & Voci, A. (2004a). Effects of direct and indirect cross-group friendships on judgments of Catholics and Protestants in Northern Ireland: The mediating role of an anxiety-reduction mechanism. *Personality and Social Psychology Bulletin*, 30, 770-786.
- Paolini, S., Hewstone, M., Rubin, M., & Pay, H. (2004b). Increased group dispersion after exposure to one deviant group member: Testing Hamburger's model of member-to-group generalization. *Journal of Experimental Social Psychology*, 40(5), 569-585.
- Paolini, S., Hewstone, M., Voci, A., Harwood, J., & Cairns, E. (2006). Intergroup contact and the promotion of intergroup harmony: The influence of intergroup emotions. In R. Brown, & D. Capozza (Eds.), *Social identities: Motivational, emotional and cultural influences* (pp. 209-238). Hove, England: Taylor & Francis.
- *Pearson, A. R., West, T. V., Dovidio, J. F., Powers, S. R., Buck, R., & Henning, R. (2008). The fragility of intergroup relations: Divergent effects of delayed audiovisual feedback in intergroup and intragroup interaction. *Psychological Science*, 19(12), 1272-1279.
- Pettigrew, T. F. (2008). Future directions for intergroup contact theory and research. *International Journal of Intercultural Relations*, 32(3), 187-199. doi: 10.1016/j.ijintrel.2007.12.002
- Pettigrew, T. F., & Tropp, L. R. (2006). A meta-analytic test of intergroup contact theory. *Journal of Personality and Social Psychology*, 90(5), 751-783. doi:10.1037/0022-3514.90.5.751
- Pettigrew, T. F., & Tropp, L. R. (2008). How does intergroup contact reduce prejudice? Meta-analytic tests of three mediators. *European Journal of Social Psychology*, 38(6), 922-934.
- Pettigrew, R. F., & Tropp, L. R. (2011). *When groups meet: The dynamics of intergroup contact*. Philadelphia, PA: Psychology Press.
- *Plant, E. A., & Butz, D. A. (2006). The causes and consequences of an avoidance-focus for interracial

- interactions. *Personality and Social Psychology Bulletin*, 32(6), 833–46.
doi:10.1177/0146167206287182
- Plant, E. A., & Devine, P. G. (2003). The antecedents and implications of interracial anxiety. *Personality and Social Psychology Bulletin*, 29, 790-801.
- *Porier, G. W., & Lott, A. J. (1967). Galvanic skin responses and prejudice. *Journal of Personality and Social Psychology*, 5(3), 253–259. Retrieved from
<http://www.ncbi.nlm.nih.gov/pubmed/6036549>
- *Rankin, R. E., & Campbell, D. T. (1954). Galvanic skin response to Negro and White experimenters. *The Journal of Abnormal and Social Psychology*, 51, 30-33.
- Rothbart, M., & John, O. P. (1985). Social categorization and behavioral episodes: A cognitive analysis of the effects of intergroup contact. *Journal of Social Issues*, 41(3), 81-104.
- Rothbart, M., Sriram, N., & Davis-Stitt, C. (1996). The retrieval of typical and atypical category members. *Journal of Experimental Social Psychology*, 32, 309-336.
- *Scheepers, D. (2009). Turning social identity threat into challenge: Status stability and cardiovascular reactivity during inter-group competition. *Journal of Experimental Social Psychology*, 45(1), 228–233. doi:10.1016/j.jesp.2008.09.011
- *Shelton, J. N. (2003). Interpersonal concerns in social encounters between majority and minority group members. *Group Processes and Intergroup Relations*, 6(2), 171–185.
doi:10.1177/1368430203006002003
- *Shook, N. J., & Fazio, R. H. (2011). Social network integration: A comparison of same-race and interracial roommate relationships. *Group Processes and Intergroup Relations*, 14(3), 399–406.
doi:10.1177/1368430210382127
- Smith, E. R. (1993). Social identity and social emotions: Toward new conceptualizations of prejudice. In D. M. Mackie & D. L. Hamilton (Eds.), *Affect, cognition, and stereotyping: Interactive processes in group* (pp. 297-315). San Diego, CA: Academic Press.

- Stark, T. H., Flache, A., & Veenstra, R. (2013). Generalization of positive and negative attitudes toward individuals to outgroup attitudes. *Personality and Social Psychology Bulletin*, 39(5), 608-622.
- Stephan, W. G. (2014). Intergroup Anxiety Theory, Research, and Practice. *Personality and Social Psychology Review*, 18(3), 238-255. 1088868314530518.
- Stephan, W. G., & Stephan, C. W. (1985). Intergroup Anxiety. *Journal of Social Issues*, 41(3), 157–175. doi:10.1111/j.1540-4560.1985.tb01134.x
- Stephan, W. G., & Stephan, C. W. (2000). An integrated threat theory of prejudice. In S. Oskamp (Ed.), *Reducing prejudice and discrimination* (pp. 23-45). Mahwah, NJ: Lawrence Erlbaum Associates Inc.
- Swart, H., Hewstone, M., Christ, O., & Voci, A. (2011). Affective mediators of intergroup contact: a three-wave longitudinal study in South Africa. *Journal of Personality and Social Psychology*, 101(6), 1221.
- *Townsend, S. S. M., Major, B., Gangi, C. E., & Mendes, W. B. (2011). From “in the air” to “under the skin”: Cortisol responses to social identity threat. *Personality and Social Psychology Bulletin*, 37(2), 151–164. doi:10.1177/0146167210392384
- *Townsend, S. S. M., Major, B., Sawyer, P. J., & Mendes, W. B. (2010). Can the absence of prejudice be more threatening than its presence? It depends on one’s worldview. *Journal of Personality and Social Psychology*, 99(6), 933–947. doi:10.1037/a0020434
- *Trawalter, S., Adam, E. K., Chase-Lansdale, P. L., & Richeson, J. A. (2012). Concerns about appearing prejudiced get under the skin: Stress responses to interracial contact in the moment and across time. *Journal of Experimental Social Psychology*, 48(3), 682–693. doi:10.1016/j.jesp.2011.12.003
- *Trawalter, S., Todd, A. R., Baird, A. A., & Richeson, J. A. (2008). Attending to threat: Race-based patterns of selective attention. *Journal of Experimental Social Psychology*, 44(5), 1322–1327. doi:10.1016/j.jesp.2008.03.006

- Tropp, L. R., Hawi, D. R., Van Laar, C., & Levin, S. (2012). Cross-ethnic friendships, perceived discrimination, and their effects on ethnic activism over time: A longitudinal investigation of three ethnic minority groups. *British Journal of Social Psychology, 51*(2), 257-272.
- Turner, R. N., Hewstone, M., Voci, A., Paolini, S., & Christ, O. (2007). Reducing prejudice via direct and indirect cross-group friendship. *European Review of Social Psychology, 18*, 212-255.
- Unkelbach, C., Fiedler, K., Bayer, M., Stegmüller, M., & Danner, D. (2008). Why positive information is processed faster: The density hypothesis. *Journal of Personality and Social Psychology, 95*(1), 36-49.
- *Vanman, E. J., Paul, B. Y., Ito, T. A., & Miller, N. (1997). The modern face of prejudice and structural features that moderate the effect of cooperation on affect. *Journal of Personality and Social Psychology, 73*(5), 941-959.
- *Vidulich, R. N., & Krevanick, F. W. (1966). Racial attitudes and emotional response to visual representations of the Negro. *The Journal of Social Psychology, 68*, 85-93.
- Voci, A., & Hewstone, M. (2003a). Intergroup contact and prejudice toward immigrants in Italy: The mediational role of anxiety and the moderational role of group salience. *Group Processes and Intergroup Relations, 6*, 37-52.
- Voci, A., & Hewstone, M. (2003b, October). *Contact and prejudice reduction in the Italian context: The impact of empathy, perspective taking, and group salience*. Paper presented at the SESP Conference, Boston, MA, USA.
- Vorauer, J., & Kumhyr, S. M. (2001). Is this about you or me? Self- versus other-directed judgments and feelings in response to intergroup interaction. *Personality and Social Psychology Bulletin, 27*, 706-719.
- *Vrana, S. R., & Rollock, D. (1998). Physiological response to a minimal social encounter: Effects of gender, ethnicity, and social context. *Psychophysiology, 35*(4), 462-469.
- Weisbuch, M., Pauker, K., & Ambady, N. (2009). The subtle transmission of race bias via televised

nonverbal behaviour. *Science*, 326, 1711-1714.

West, K., Holmes, E., & Hewstone, M. (2011). Enhancing imagined contact to reduce prejudice against people with schizophrenia. *Group Processes & Intergroup Relations*, 14(3), 407-428.

*Westie, F. R., & De Fleur, M. L. (1959). Autonomic responses and their relationship to race attitudes. *Journal of Abnormal Psychology*, 58(3), 340-347. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/13653884>

Wilder, D. A., & Shapiro, P. N. (1989). Effects of anxiety on impression formation in a group context: An anxiety-assimilation hypothesis. *Journal of Experimental Social Psychology*, 25, 481-499.

Wilder, D. A., & Shapiro, P. N. (1991). Facilitation of outgroup stereotypes by enhanced ingroup identity. *Journal of Experimental Social Psychology*, 27, 431-452.

Wright, S. C., Aron, A., McLaughlin-Volpe, T., & Ropp, S. A. (1997). The extended contact effect: Knowledge of cross-group friendships and prejudice. *Journal of Personality and Social Psychology*, 73(1), 73-90.

Wright, S. C., Aron, A., & Tropp, L. R. (2002). Including others (and groups) in the self: Self-expansion and intergroup relations. In J. P. Forgas & K. D. Williams (Eds.), *The social self: Cognitive, interpersonal and intergroup perspectives* (pp. 343-363). Philadelphia: Psychology Press.

Zajonc, R. B. (1998). Emotions. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (Vol. 1, 4th ed., pp. 591-632). New York: McGraw-Hill.

Footnotes

1. The articles listed in Tables 1 and 2 were located in Psycinfo and Pubmed. Reference lists of located articles and key authors' publication pages were also used to identify relevant publications. Articles were included in the review if they investigated outgroup anxiety or compared outgroup anxiety with ingroup anxiety (i.e., intergroup-intragroup comparisons) on psychophysiological and/or behavioral markers of anxiety. Studies including exclusively self-reports of anxiety were excluded (see Paolini et al.'s 2006 for a review of this literature), but findings on self-report measures were considered if reported side-by-side psychophysiological or behavioral findings.
2. This research trend is at odds with the research practices of mainstream and traditional correlational research of the contact-anxiety link; there the inclusion of group-level outcomes was a standard routine (see Table 11.2 in Paolini et al., 2006; $n = 17$ out of 18 studies or 94.44% of reviewed studies at that time included outgroup-level variables) because of a concurrent interest in the broader contact-prejudice link.
3. Future research still needs to identify the conditions under which D , i.e., the inter/intra-group difference in anxiety, tends to zero (bottom panel), which is equivalent to the intergroup and intragroup lines intersecting in the top panel.
4. In our earlier work (Paolini et al., 2006), we offered an extensive discuss of several important methodological differences between experimental and correlational investigations of intergroup contact and anxiety. In this article, our intention is not that of providing a comprehensive explanation of this apparent disconnect between research traditions. Hence, after discussing the possible involvement of systematic differences in contact valence, the on-line/memory-basis of the interaction, and individuals' motivational goals, our discussion selectively turns to methodological differences that are most relevant to an explanation of this apparent research disconnect in terms of temporal integration of contact experiences over the lifespan—i.e., our

learning model of anxiety.

5. In reviewing emerging physiological and behavioral research, the term 'anxiety learning' will be used in a narrower and more technical way than in earlier sections of this article to refer to changes in episodic anxiety that are *stimulus-specific* or *contingency bound*; a process called in the learning literature 'acquisition' of anxiety.

Tables

Table 1. Intergroup contact studies that have experimentally investigated physiological and behavioral forms of intergroup vs. intragroup anxiety

Study	Participants and Intergroup Setting	Task/Cover Story	Anxiety Type and Anxiety Source*	Direction of Intergroup (vs. Intragroup) Effect**
Amodio (2009)	White American students	A study about social attitudes	Physiological: Cortisol (I)	Physiological: Null effect
	interacting with a White or Black individual		Behavioral: Weapons Identification Task (G)	Behavioral: Black-faced primes speeded responses to handguns compared to tools
			Subjective: State Affect Checklist (S)	Subjective: Higher in intergroup
Amodio & Hamilton (2012)	White American female students	Discussing their views about	Behavioral: IAT (G)	Behavioral: Unpleasant words categorized more accurately than pleasant words in the context of Black faces, whereas pleasant words categorized more accurately than unpleasant words in the context of White faces
	interacting with a White or Black female partner	social issues	Subjective: State Affect Checklist (S)	Subjective: Higher in intergroup
Blascovich, Mendes, Hunter, Lickel & Kowai-Bell (2001, Study 1)	American female students	Study on "interpersonal styles and	Physiological: Ventricular Contractility, Cardiac	Physiological: Increased cardiovascular threat
	interacting with an individual with or without a birthmark	working together".	Output and Total Peripheral Resistance (I, C)	
Blascovich, Mendes, Hunter, Lickel & Kowai-Bell (2001, Study 2)	American female students	Study on "interpersonal styles and	Physiological: Ventricular Contractility, Cardiac	Physiological: Increased cardiovascular threat
	interacting with an individual with or without a birthmark	working together".	Output and Total Peripheral Resistance (I, C)	Behavioral: Depleted task performance via less words generated
			Behavioral: Word-finding task (I)	
Blascovich, Mendes, Hunter, Lickel & Kowai-Bell (2001, Study 3)	Non-black American female	Study on "interpersonal styles and	Physiological: Ventricular Contractility, Cardiac	Physiological: Increased cardiovascular threat

	students interacting with a White working together".		Output and Total Peripheral Resistance (I, C)	Behavioral: Depleted task performance via less words generated
	or Black individual of high or low		Behavioral: Word-finding task (I)	
	SES			
Brown, Bradley & Lang (2006)	African American or European American students viewing African American or European American faces	Not provided	Physiological: Skin Conductance and Electromyogram (I, C) Behavioral: Viewing time (I, C)	Physiological: European American participants had larger skin conductance responses when viewing White faces; For the Electromyogram, African American participants had larger corrugator responses when viewing unpleasant Black faces than unpleasant white faces; Behavioral: Participants viewed pleasant pictures of their ingroup for longer than pleasant pictures of their outgroup
Gray, Mendes & Denny-Brown (2008)	White or Black Americans interacting with a White or Black interviewer	Not provided	Physiological: Cortisol (I) Subjective: Research assistants rated participant's level of anxiety via a silent videotaped recording (O)	Physiological: Observer ratings of anxiety predicted cortisol changes; Same-race research assistants positively predicted cortisol increases whereas different race research assistants negatively predicted cortisol increases Subjective: Same-race research assistants rated participants as more anxious when engaging with an outgroup interviewer; No difference when the research assistant was of a different race to the participant.
Littleford, Wright & Sayoc-Parial (2005)	White, Black and Asian American students interacting with White, Black or Asian individuals	A study on the effect of interracial interaction on health and attitudes	Physiological: Blood Pressure (I, C) Subjective: Self-reported anxiety (CLQ) (G)	Physiological: Increased blood pressure Subjective: Higher in intergroup

Mallan, Sax & Lipp (2009)	Caucasian Australians viewing White or Asian faces	Not provided	Physiological: Skin Conductance and Startle Blink (I, C)	Physiological: Resistance to extinction (i.e., lack of reduction in anxiety)
Mendes, Blascovich, Hunter, Lickel & Jost (2007, Study 2)	American male students interacting with a Male White or Latino partner of high or low SES	Not provided	Physiological: Ventricular Contractility, Cardiac Output and Total Peripheral Resistance (I, C) Behavioral: Word-finding task (Boggle) (I)	Physiological: Increased cardiovascular threat Behavioral: Least amount of words found if paired with Latino high SES partner than all other conditions. Most words found if paired with White high SES partner
Mendes, Blascovich, Hunter, Lickel & Jost (2007, Study 3)	American female students interacting with a White or Asian Female partner, who had a Southern or regional accent	Not provided	Physiological: Ventricular Contractility, Cardiac Output and Total Peripheral Resistance (I, C) Behavioral: Behavior coding (Affirmations and body language of participant) (O); Word-finding task (I)	Physiological: Increased cardiovascular threat Behavioral: Less affirmations and positive body language, as well as least amount of words found if paired with Asian Southern Accent partner than all other conditions. Most affirmations, positive body language and words found if paired with White Regional Accent partner
Mendes, Blascovich, Lickel & Hunter (2002)	Non-black American male students interacting with a White or Black individual	A study on interpersonal styles and working together	Physiological: Ventricular Contractility, Cardiac Output and Total Peripheral Resistance (I, C) Behavioral: Word-finding task (Boggle) (I)	Physiological: Increased cardiovascular threat Behavioral: Depleted task performance via less words generated
Mendes & Koslov (2012, Study 1a)	White and Black American students interacting with a White or Black female	A study on physiological responses during laboratory tasks	Behavioral: Behavior coding (smiles, nodding, laughing, positive statements) by research assistants of participant interaction with confederate (O)	Behavioral: White participants smiled, laughed and nodded more frequently when interacting with an outgroup member
Mendes & Koslov (2012, Study 1b)	Female American students	A study on getting to know each other	Physiological: Cardiac Output and Total	Physiological: Participants interacting with a stigmatized partner displayed a

	interacting with an individual with other or without a birthmark		Peripheral Resistance (I, C)	positive relationship between smiling frequency and physiological threat whereas those interacting with a non-stigmatized partner displayed a negative relationship between smiling frequency and threat
			Behavioral: Behavior coding (smiles, nodding, laughing, positive statements) by research assistants of participant interaction with confederate (O)	Behavioral: Participants smiled more frequently when interacting with a stigmatized partner
Navarrete, McDonald, Asher, Kerr, Yokota, Olsson & Sidanius (2012)	White and non-white American students viewing white faces with different colored t-shirts	Not provided	Physiological: Skin Conductance (I, C)	Physiological: Higher levels of skin conductance to outgroup members relative to ingroup members following conditioning task
Navarrete, Olsson, Ho, Mendes, Thomsen & Sidanius (2009)	White and Black Americans viewing white faces with different body connection in response to colored t-shirts	A study that explores the mind- body connection in response to social groups	Physiological: Skin Conductance (I, C) Behavioral: IAT (G) Subjective: Explicit Race Bias (Attitudes Towards Blacks scale) (G)	Physiological: Resistance to extinction (i.e., lack of reduction in anxiety) Behavioral: Not reported Subjective: Not reported
Olsson, Ebert, Banaji & Phelps (2005, Study 2)	White and Black Americans viewing White and Black faces	Not provided	Physiological: Skin Conductance (I, C) Behavioral: IAT (G)	Physiological: Resistance to extinction (i.e., lack of reduction in anxiety) Behavioral: White participants displayed negative stereotypes with Black Americans, whereas Black participants displayed no outgroup bias
Plant & Butz (2006, Study 1a)	Non-black American psychology students interacting with a Black or White partner	A study examining interracial interactions	Behavioral: Automatic attitudes (modelled after Fazio, Jackson, Dunton & Williams, 1995) (G) Subjective: Self-reported anxiety (Anxiety scale)	Behavioral: Null finding Subjective: Higher in intergroup

(I)

Porier & Lott (1967)	White American males interacting with White and Black experimenters	Not provided	Physiological: Skin Conductance (I, C)	Physiological: Null effect
Rankin & Campbell (1955)	White American male students interacting with White and Black experimenters	Not provided	Physiological: Skin Conductance (I, C)	Physiological: Increased skin conductance responses
Townsend, Major, Gangi & Mendes (2011; Study 1)	European females interacting with Male interviewer, competing stress response during interview for position with either Male or Female	A study measuring the body's situations	Physiological: Cortisol (I) Subjective: Self-reported anxiety (Brief Symptoms Inventory; how often participant experiences subset of anxiety symptoms) (S)	Physiological: Increased cortisol levels Subjective: Null effect
Trawalter, Adam, Chase- Lansdale & Richeson (2012, Study 1)	White American students viewing White and Black faces	Study on the physiology of social behavior during an interaction	Physiological: Cortisol (I)	Physiological: Increased cortisol levels
Vanman, Paul, Ito & Miller (1997, Study 1)	White, non-Hispanic American students interacting with White and Black individuals	Not provided	Physiological: Electromyogram (I, C)	Physiological: EMG showed more positive facial affect for White, relative to Black, contact partners
Vanman, Paul, Ito & Miller (1997, Study 2)	White, non-Hispanic American students interacting with White and Black individuals	Not provided	Physiological: Electromyogram (I, C)	Physiological: EMG showed more positive facial affect for White, relative to Black, contact partners

Vrana & Rollock (1998)	Black and White American students interacting with White or Black partners	A study on the psychophysiology of emotional imagery	Physiological: Heart rate, Skin Conductance, and Electromyogram (I, C)	Physiological: Increased heart rate when interacting with an outgroup partner; Null for skin conductance; EMG displayed greater zygomaticus activity when interacting with an outgroup partner
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Note. * For anxiety type, we rely on Blascovich, Mendes and colleagues' tripartite definition of physiological, behavioral and subjective anxiety (Blascovich et al., 2001; Mendes et al., 2002). For anxiety source, we rely on Greenland et al.'s (2012) distinction of anxiety appraisal sources. ** Unless otherwise indicated, effects are in the direction of anxiety being higher in the intergroup than intragroup condition. I = indicates individual level variable (episodic anxiety relevant to a specific individual outgroup member/s). G = indicates group level variable (chronic anxiety relevant to entire outgroup). O = indicates anxiety stemming from other individual(s). S = indicates anxiety stemming from participant self-reflecting on own anxiety; C = Continuous measure of anxiety (measure is not a one-off measurement but is rather collected continuously throughout the task; by exclusion all other measurements are discrete in nature).

Table 2. Intergroup contact studies that have experimentally investigated physiological and Behavioral forms of intergroup anxiety and tested for moderation

Study	Moderator Category	Participants and Intergroup Setting	Task/Cover Story	Anxiety Type* and Target of Anxiety (Individual vs. Group)	Moderation Effect**
Mendes, Gray, Mendoza-Denton, Major & Epel (2007b)	Attitudes (IAT)	White American students interacting with a White or Black interviewer	Not provided	Physiological: Catabolic and Anabolic Cortisol release and recovery (I) Behavioral: Task performance (I) Subjective: Interviewer ratings of participant anxiety (O)	Physiological: At low level of bias: Higher anabolic cortisol reactivity and faster cortisol reaction At high level of bias: Lower anabolic cortisol reactivity and slower cortisol reaction Behavioral & Subjective: At low level of bias: Higher anxiety ratings by interviewer during task performance At high level of bias: Lower anxiety ratings by interviewer during task performance
Trawalter, Adam, Chase-Lansdale & Richeson (2012, Study 1)	Chronic Anxiety (motivation to respond without prejudice)	Black and White American students interacting with White and Black research assistants	Study on the physiology of social behavior during an interaction	Physiological: Cortisol (I) Behavioral: Behavior coding (smiles, eye gaze) by research assistants of participant interaction with confederate (O)	Behavioral & Physiological: At low motivation to respond without prejudice: Lower Behavioral and physiological indicators of stress At high motivation to respond without prejudice: Higher Behavioral and physiological indicators of stress
Trawalter, Adam, Chase-Lansdale & Richeson (2012,	Chronic Anxiety	Black and White American	Not provided	Physiological: Cortisol slopes (I)	Physiological:

Study 2)	(motivation to respond without prejudice); Past Contact (quantity)	students who reported on daily intergroup interactions		Behavioral: Self and other initiated intergroup contact throughout the year (G) Subjective: Attitude towards Blacks scale (G, S)	At low motivation to respond without prejudice: Greater cortisol slopes during spring the more interracial contact they had during the year At high motivation to respond without prejudice: Greater cortisol slopes during spring the less interracial contact they had during the year Behavioral: Not tested for moderation Subjective: Not tested for moderation
Page-Gould (2012)	Past Contact (intergroup friends)	Canadian participants who reported on cross-group ethnic contact	Not provided	Behavioral: Approach/avoidance (G, S) Subjective: Initiation of intergroup contact (G, S)	Behavioral: At low cross-group friendships: Unrelated to social support following conflict At high cross-group friendships: Sought cross-group social support following conflict Subjective: At low cross-group friendships: Less intergroup interactions initiated following intergroup conflict At high cross-group friendships: No change in intergroup interactions initiated following intergroup conflict
Page-Gould, Mendes & Major (2010)	Past Contact (friendship quality)	Black and White (American or Canadian) adults	Not provided	Physiological: Respiratory Sinus Arrhythmia and Parasympathetic activity (I, C) and	Physiological: For low contact quality: Less respiratory sinus rebound and slower

interacting with a White or

Black partner

Cortisol (I)

cortisol recovery after and intergroup stressor For high contact

quality: Greater respiratory sinus rebound and faster cortisol recovery

after an intergroup stressor

Page-Gould, Mendoza-Denton & Tropp (2008)

Past contact

(Quantity); Chronic

Anxiety (Rejection

Sensitivity); Attitudes

(IAT)

American students who

interacted with White or

Latino/a partner

Study on the effect of

friendship on college

adjustment

Physiological: Cortisol (I)

Subjective: Daily intergroup contact diary (G,

S)

Physiological:

For low contact: Cortisol reactivity was positive for high rejection

sensitivity; flat effect for low rejection

For high contact: Cortisol reactivity was negative for high rejection

sensitivity; flat effect for low rejection

At low level of bias: No relationship between cortisol and time as

friendships developed

At high level of bias: Lower cortisol reactivity across time as

friendships developed

Subjective:

At low level of bias: No effect of friendship condition

At high level of bias: More cross-group contact was self-initiated and

reduced anxious mood reported following cross-group contact in the

lab

Blascovich, Mendes, Hunter, Past Contact (quantity) Non-black American female
Lickel & Kowai-Bell (2001, Study 3)

students interacting with a

Study on "interpersonal

styles and working

Physiological: Ventricular Contractility,

Cardiac Output and Total Peripheral

Physiological:

For low contact: Lower Ventricular Contractility and Cardiac Output,

White or Black individual of together".

high or low SES

Resistance (I, C)

Behavioral: Word-finding task (Boggle) (I)

but higher Total Peripheral Resistance

For high contact: Higher Ventricular Contractility and Cardiac Output, but lower Total Peripheral Resistance, all indicative of threat

Behavioral: Not reported

Olsson, Ebert, Banaji & Phelps (2005, Study 2)

Past contact

(interracial dating)

White and Black Americans

viewing White and Black

faces

Not provided

Physiological: Skin Conductance (I, C)

Behavioral: IAT (G)

Physiological:

For low interracial dating: Greater extinction bias towards outgroup faces

For high interracial dating: Lower extinction bias towards outgroup faces

Behavioral: Not reported

Navarrete, Olsson, Ho, Mendes, Thomsen & Sidanius (2009)

Past Contact (quantity)

White and Black Americans

viewing white faces with

different colored t-shirts

A study that explores the

mind-body connection in

response to social

groups

Physiological: Skin Conductance (I, C)

Behavioral: IAT (G)

Subjective: Explicit race bias (Attitudes

Towards Blacks scale) (G)

Physiological:

For low contact: Inflated physiological responding to outgroup male faces was reduced more slowly

For high contact: Inflated physiological responding to outgroup male faces was reduced more readily

Behavioral: Not reported

Subjective: Not reported

Jamieson, Koslov, Nock & Mendes (2013)

Expectancy Violation

(attributional

Black and White Americans

interacting online with a

A study on how the

nature of communication

Physiological: Ventricular Contractility, Cardiac Output and Total Peripheral

Physiological:

For out-group feedback (attributionally ambiguous): Higher Cardiac

	ambiguity)	White or Black avatar	has changed now that our social lives are increasingly moving online	Resistance (I, C); Cortisol (I) Behavioral: Behavior coding (approach and avoidance) by research assistants of participant interaction with confederate (O)	Output and lower Total Peripheral Resistance For In-group feedback (attributionally non-ambiguous): Greater increases in cortisol following the interaction compared to out-group rejection Behavioral: For out-group feedback (attributionally ambiguous): More observed anger
Mendes, Blascovich, Hunter, Lickel & Jost (2007, Study 1)	Expectancy Violation (ethnicity crossed with SES)	American female students interacting with a Female White or Latina partner of high or low SES	Not provided	Physiological: Ventricular Contractility, Cardiac Output and Total Peripheral Resistance (I, C) Behavioral: Word-finding task (Boggle) (I)	Physiological: For stereotype consistent: Lower physiological threat responses For stereotype inconsistent: Higher physiological threat responses. Behavioral: No moderation effect found
Mendes, Blascovich, Hunter, Lickel & Jost (2007, Study 2)	Expectancy Violation (ethnicity crossed with SES)	American male students interacting with a Male White or Latina partner of high or low SES	Not provided	Physiological: Ventricular Contractility, Cardiac Output and Total Peripheral Resistance (I, C) Behavioral: Word-finding task (Boggle) (I)	Physiological: For stereotype consistent: Lower physiological threat responses For stereotype inconsistent: Higher physiological threat responses Behavioral: For stereotype consistent: More words were generated For stereotype inconsistent: Less words were generated
Mendes, Blascovich, Hunter, Lickel & Jost (2007, Study 3)	Expectancy Violation	American female students	Not provided	Physiological: Ventricular Contractility,	Physiological:

(ethnicity crossed with interacting with a White or
 accent) Asian Female partner, who
 had a Southern or regional
 accent

Cardiac Output and Total Peripheral

Resistance (I, C)

Behavioral: Behavior coding (Affirmations

and body language of participant) (O); Word-

finding task (Boggle) (I)

For stereotype consistent: Lower physiological threat responses

For stereotype inconsistent: Higher physiological threat responses

Behavioral:

For stereotype consistent: More observable positive behavior and
 more words were generated

For stereotype inconsistent: Less observable positive behavior and
 less words were generated

Mendes, Major, McCoy & Blascovich (2008)	Expectancy Violation (Acceptance/rejection by partner)	Not provided	Black and White American students interacting with a White or Black confederate	Physiological: Ventricular Contractility, Cardiac Output and Total Peripheral Resistance (I, C)	Physiological:
				Behavioral: Behavior coding (vigilance, external negative emotions, positive emotions) by research assistants of participant interaction with confederate (O)	For high rejection from different race partner: lower Cardiac Output, but higher Total Peripheral Resistance
				Subjective: Stephan & Stephan's (1985) intergroup anxiety scale (S)	For high rejection from same-race partner: Increased cardiac output, but lower Total Peripheral Resistance
					For high acceptance from same-race partner: Higher Cardiac Output, but lower Total Peripheral Resistance
					For high acceptance from different-race partner: Lower Cardiac Output but higher Total Peripheral Resistance for Black participants; Higher Cardiac Output, but lower Total Peripheral Resistance for White participants
					Behavioral:
					For high rejection: Increased anger when interacting with different-race evaluators;
					For high acceptance: Increased vigilance when interacting with cross-race evaluators
					Subjective:
					For high rejection: Greater negative emotion when rejected by a

different-race evaluator

For high acceptance: Increased positive emotion when interacting with same-race evaluators

Townsend, Major, Sawyer & Mendes (2010, Study 1)	Expectancy Violation (system justifying beliefs regarding status differences)	Latina female participants interacting with a white female confederate who was purportedly prejudiced or not against ethnic minorities	A study on interactions among coworkers	Physiological: Ventricular Contractility, Cardiac Output and Total Peripheral Resistance (I, C)	Physiological: For endorsing meritocracy: Greater threat responses when interacting with a White peer who was purportedly prejudiced against ethnic minorities than a non-prejudiced White peer For prejudice: Less threat responses when interacting with a White peer who was purportedly prejudiced against ethnic minorities, than a non-prejudiced White peer
Townsend, Major, Sawyer & Mendes (2010, Study 2)	Expectancy Violation (system justifying beliefs regarding status differences)	White female participants interacting with a White male confederate	A study of effective interviewing	Physiological: Heart Rate, Ventricular Contractility, Cardiac Output and Total Peripheral Resistance (I, C) Behavioral: Confederate rating of how nervous participant appeared (O)	Physiological: For endorsing meritocracy: Same level of threat, following a sexist or merit rejection, during tasks including speech preparation and delivery, the cognitive task and after the interview For prejudice: Lower threat responses, following a sexist (vs. merit) rejection, during tasks including speech preparation and delivery, the cognitive task and after the interview Behavioral:

For endorsing meritocracy: Rated by confederates as equally nervous
in the sexist and merit conditions

For prejudice: Rated by confederates as less nervous in the sexist
(vs. merit) condition

Note. * For anxiety type, we rely on Blascovich, Mendes and colleagues' tripartite definition of physiological, behavioral and subjective anxiety (Blascovich et al., 2001; Mendes et al., 2002). For anxiety source, we rely on Greenland et al.'s (2012) distinction of anxiety appraisal sources. ** Unless otherwise indicated, effect is in the direction of anxiety being higher in the intergroup than intragroup condition. I = indicates individual level variable (episodic anxiety relevant to a specific individual outgroup member/s). G = indicates group level variable (chronic anxiety relevant to entire outgroup). O = indicates anxiety stemming from other individual(s). S = indicates anxiety stemming from participant self-reflecting on own anxiety; C = Continuous measure of anxiety (measure is not a one-off measurement but is rather collected continuously throughout the task; by exclusion all other measurements are discrete in nature).

Figure Caption

Figure 1. Explanatory diagram illustrating how Blascovich et al.'s ground-breaking design isolated simultaneously two distinct contact effects on anxiety traditionally investigated in separate research traditions by incorporating both an intragroup-intergroup between-group condition (Intragroup/Intergroup in the bottom panel) and a prior contact measured moderator (Low contact/High contact Moderator in the bottom panel).

Figure 2. Diagram depicting our time-integrated model of anxiety learning. Diamonds depict moderation effects. Episodic contact causes episodic anxiety (link from 'episodic contact' to 'episodic anxiety'), as well as changes in those anxieties (loop indicated 'contingency-bound (anxiety) learning'). Passage of time from distant past to present is encoded using gradually lighter shades of black to grey. Past contact experiences accumulate over an individual's lifetime to form a repertoire of cumulative contact (CC; medium grey), which underpins chronic anxiety (CA), but also moderates deductive (feed-forward, group-to-individual generalization) and inductive (feed-back, individual-to-group generalization) learning links between chronic and episodic anxiety. Out-group prejudice (OP) moderates deductive learning and category salience (CS) moderates inductive learning, while cumulative contact and chronic anxiety both moderate contingency-bound (anxiety) learning (see text for more details). The effects of contact valence are discussed extensively in the text, but are not depicted diagrammatically for sake of clarity.

Figure 1

Figure 2