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Do Social Control Motives Combine with Perceptions of Social Support to Predict Relationships between Interpersonal Stress and Blood Pressure in the Normal Environment?

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Abstract

Social support is related to lower risk for cardiovascular disease development. Yet, research has failed to yield consistent evidence for psychological mechanisms of relationships between social support and health outcomes. Explanations for these failures include limitations of research design and statistical analysis, inadequate theory-building, and a failure to investigate implicit psychological processes that operate during normal everyday social interactions. The present study utilized a promising theoretical framework (i.e., social action theory) to evaluate implicit mechanisms within a naturalistic observation study design using multilevel modeling.

The primary aims of this study were to evaluate the role of between-person differences in agonistic motives and perceived social support in predicting within-person processes of interpersonal stress and cardiovascular responding. Results indicated that interpersonal stress was associated with higher ambulatory SBP. The dissipated group had the highest DBP, and was also more obese compared to the other groups. Results indicated that perceived social support attenuated the effect of interpersonal stress on SBP. Results did not support the notion that motives moderate the relationships between perceived social support, interpersonal stress, and ambulatory blood pressure. These results suggest a potential new disease pathway for cardiovascular disease risk, and provide support for the role of perceived social support as an implicit regulatory mechanism which lowers cardiovascular activity in interpersonally stressful contexts.

Keywords: agonistic motives, perceived social support, interpersonal stress, ambulatory blood pressure, ecological momentary assessment, multilevel modeling

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DISSERTATION

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Social support is consistently related to lower risk for adverse health outcomes and all-cause mortality (Barth, Schneider, & von Känel, 2010; Holt-Lunstad, Smith, & Layton, 2010). Comparison of estimated effect-sizes from meta-analytic reviews indicate that the effects of social support on all-cause mortality are larger than the effect of cigarette smoking, and almost three times the magnitude of the effects of central body adiposity (i.e., body mass index, BMI) and physical exercise, controlling for body mass index (BMI; Holt-Lunstad, Smith, & Layton, 2010). A substantial body of evidence links low social support to greater likelihood of developing cardiovascular disease (Barth, Schneider, & von Känel, 2010; Holt-Lunstad, Smith, & Layton, 2010). Although many studies have sought to explain the link through psychological mediators, the evidence suggests that the relationship between social support and cardiovascular disease is not adequately explained by indirect influences through positive or negative affect, depression, self-worth, self-esteem, self-efficacy, or distress (see Uchino, Bowen, Carlisle, & Birmingham, 2012). Some theorists have advanced the controversial notion that perhaps there are no mediating psychological mechanisms, and argue instead that social support influences health directly through unspecified neural mechanisms (House, Landis, & Umberson, 1988; Uchino et al., 2012). Yet, another possibility is that traditional approaches to conceptualizing the links between social support and health do not adequately measure important constructs (i.e., supportive gestures apparent in "mundane" daily activities; Lakey & Orehek, 2011; Uchino et al., 2012), do not address

other important mechanisms (e.g., implicit processes) by which social support affects health (Uchino et al., 2012), and do not consider alternative considerations of "mechanisms" (i.e., assessing for moderation and contextual factors).

In this dissertation I consider three major reasons why research has failed to yield consistent evidence for psychological mediation of relationships between social support and health outcomes. These explanations include limitations of research design and statistical analysis, inadequate theory-building and testing, and a failure to investigate implicit psychological processes that operate during normal everyday social interactions. This perspective suggests the need for an investigative approach that integrates implicit motivational and self-regulatory mechanisms, and examines their impact on health indices in natural social settings.

In the sections that follow, I will review three major criticisms of existing social support research and indicate how they have limited progress in understanding how support affects health. I then will introduce a new perspective afforded by social action theory which raises new questions that suggest a promising way forward. This latter approach forms the basis for the specific hypotheses that are tested in the dissertation research reported here.

Psychological Mechanisms by which Social Support affects Health

Social support often is categorized as either "structural" or "functional." Structural social support refers to how one's social support network is structured; for example, with respect to the number of people with whom one maintains regular social relationships, the frequency with which one spends time with others, and one's marital status (Cohen & Wills, 1985). There have been further efforts to characterize structural

elements in terms of "social ties" by examining the number and the quality of various social relationships (Rook, 1984). Within this framework, social ties that are regarded as "ambivalent" (i.e., relationships which include both positive and negative exchanges) or "problematic" (i.e., include only negative exchanges) undermine physical health (Rook, Luong, Sorkin, Newsom, & Krause, 2012). Functional support refers to the functions that supportive relationships .perform. The different functions of social support have generally been defined as "social companionship", defined by spending time with others; "esteem support" or "emotional support", defined by the extent to which relationships provide empathy, concern, nurturance, and feelings of acceptance and self-esteem; "informational support", defined by how much others help understand one's problems or offer suggestions for coping; and "instrumental support", defined by the assistance and resources that others are able to provide (e.g., financial assistance, time; Cohen & Wills, 1985; House, 1981). Both structural and functional aspects of social support predict health and disease, although functional aspects of support tend to have larger effects (Barth et al., 2010). A further distinction in the definition and measurement of functional support is whether social support is perceived or received. Whereas received social support definitions focus on actual events, occasions, or experiences when one was supported, perceived social support is defined in terms of one's belief that social support is available, regardless of one's need or desire to make use of that support. It is important to note that perceived social support has the largest and most consistent relationship with health outcomes; whereas the relationship between received social support and health outcomes is tenuous, inconsistent, and seems to depend more on a receiver's personality traits and contextual factors. Yet, researchers and theorists have yet to explain *how*

perceptions of one's social support affect health processes. In this section, I briefly outline some recent concepts, questions, and problems that have marked discussions about the relationships between social support and health. Important limitations of current research suggest the need for a new conceptual approach to these questions.

The consistent evidence and substantial effect sizes supporting a connection between social support and health outcomes has led health researchers to ask the important question: how does social support influence *physiological processes* related to health outcomes? Models of mechanisms have typically centered on two hypothesized pathways, one highlighting the role of social support in helping individuals alter lifestyle behaviors, and the other focusing on the role of social support in altering psychological processes which are known to affect stress and health. A substantial body of research evidence consistently supports the notion that social support exerts an effect on health outcomes through increasing adherence to exercise programs, healthy eating, and smoking cessation (Murray, Johnston, Dolce, Lee & O'Hara, 1995; Trieber, Batanowski, Broden, Strong, Levy & Knox, 1991). However, evidence supporting the role of psychological mechanisms derived from predominant theoretical perspectives has been somewhat mixed, suggesting the need to widen our focus to other possible explanations of the social support-health relationship (Uchino et al., 2012).

The most influential theory guiding research on psychological mechanisms is the stress-buffering hypothesis (e.g., Cohen & Wills, 1985; Wills, 2004). This conceptual framework was developed from a stress and coping perspective (e.g., Lazarus & Folkman, 1984) and posits cognitive appraisal mechanisms that lower or increase stress responses by fostering adaptive (effective) or maladaptive (ineffective) modes of coping.

For instance, Cohen and Wills suggest that the feeling that one is supported by others is a "resource" which enhances confidence that one is able to deal with a given stressor, and thereby induces self-appraisals (e.g., the appraisal that one can cope effectively) which lower subjective and physiological stress responses. Thus, believing that one will receive social support reduces the emotional and physiological responses one would normally have in response to a stressful situation (Wills & Ainette, 2012). Other hypothesized psychological mediators derived from research on social support and mental health. The latter mediators include: depressive symptoms, self-esteem, and a sense of well-being (e.g., Berman, Glass, Brissette, & Seeman, 2000; Uchino, 2004). Yet, despite more than 30 years of research on potential psychological mediators, mechanisms suggested by the dominant appraisal and personality trait frameworks have yielded little insight into the problem (Uchino et al., 2012).

As Uchino and colleagues have noted (2012), despite evidence linking perceived social support to many of these hypothesized appraisal and personality trait mechanisms, and evidence linking these mechanisms to physical health outcomes, models which include both social support *and* the proposed mediating mechanisms do not support mediation (in other words, a strong direct effect of social support on health remains, even after controlling for the mediators). In an effort to explain this lack of evidence, Uchino and colleagues (2012) offered three overarching possibilities. These writers propose that failures to detect psychological mediation may be due to: (1) inadequate study designs and statistical tests of indirect effects, (2) overemphasis on but a few dominant theoretical models to the exclusion of other compelling models, and (3) the possibilities that either no psychological processes mediate the association between social support and health, or

that conceptual definitions and assessment methods need important alterations. Another important consideration involves the concept of "mechanisms." Research has focused on the statistical mediation (i.e., is the effect of social support on health *carried by* an intermediate construct such as depressive symptoms?). Yet, conceptually the notion of mechanism can be expanded to include statistical moderation (i.e., *for whom* do we observe this relationship?) and contextual factors (i.e., under which *circumstances is the relationship observed*?). In other words, the extent to which a mechanism operates is often influenced (moderated) by other factors. When examining potential mechanisms of social support, it may be important also to investigate the factors that moderate the suspected mechanism.

Inadequate Research Designs

Uchino and colleagues' first explanation for the lack of evidence for mediating psychological variables focuses on the use of study designs and statistical analysis techniques that may not be sensitive enough to detect evidence of mediation. In particular, most studies have used conservative tests of mediation such as the Sobel test (Baron & Kenny, 1986), which do not allow for tests of partial mediation or multiple mediator effects (see Hayes, 2009; Preacher & Hayes, 2008). As the authors note, many studies have employed widely-validated measures in highly controlled laboratory protocols that, being well crafted to reduce measurement error, seemingly should create the perfect conditions for providing evidence for mediation, if it indeed exists. Yet, other important aspects of study design that are not employed in this research may affect the ability to detect indirect effects. In particular, the evidence indicates a need to account for individual differences and person-by-environment interactions—a consideration that

reveals important limitations of controlled laboratory designs. This suggests the importance of expanding the evaluation of "mechanisms" to ask not only about mediation but also about moderation: For whom does this work and under what circumstances?

Results of laboratory studies have highlighted the complexity of the support-stress relationship, revealing the need for conceptual models of social support and health that account for an array of individual differences and the influence of person-by-environment interactions. Laboratory studies of social support and cardiovascular responses have employed a wide variety of stressor designs, including public speaking, speech preparation, mental arithmetic, and group discussions about controversial issues (Cosley, McCoy, Saslow, & Epel, 2010; Gerin, Pieper, Levy, & Pickering, 1992; Glynn, Christenfeld, & Gerin, 1999; Gramer & Reitbauer, 2010; Gump, Polk, Kamarck, & Shiffman, 2001; Uchino & Garvey, 1997)**.** These studies have found that effects of social support are inconsistent, and tend to vary as a function of both the type of stressor (e.g., Gramer & Reitbauer, 2010) and whether support was offered by a self-selected close friend versus a stranger (Gerin et al., 1992; Gump et al., 2001). In terms of person-level contributions, the magnitude of physiological responses in the context of social support depends on individual differences in recipient-personality (e.g., Holt-Lunstad, Uchino, & Smith, 2008; Vella, Kamarck, & Shiffman, 2011), support-provider personality (e.g., Holt-Lunstad et al., 2008), preferences for support-types (e.g., instrumental, emotional; Uchino, 2006, 2012; Vella et al., 2011), and how well the support received matches the goal of the support-seeker (Horowitz, Krasnoperova, Tatar, Hansen, Person, Galvin et al., 2001**)**. Furthermore, the same person may prefer different types of support for different

problems that they encounter from day to day, a factor that is difficult to assess and test in a laboratory setting.

Although laboratory studies offer a greater degree of experimental-control, there is a cost to ecological validity. Employing laboratory stressors and measuring cardiovascular responses poses a challenge as slight changes in setting or situation can produce inconsistencies among cardiovascular measurements (Christenfeld, Glynn, Kulik, & Gerin, 1998). Another challenge for laboratory stress paradigms involves the degree to which cardiovascular responses recorded in the laboratory during exposure to controlled stressors correlate with responses to stressful events that occur in the natural environment. Although the evidence linking laboratory stress responses to responses in the natural environment is inconsistent, the correspondence seems to depend on the stress-paradigm used and the likelihood that individuals experience similar types of stress in the natural environment (Gerin, Christenfeld, Pieper, DeRafael, Su, Stroessner et al., 1998; Kamarck, Schwartz, Janicki, Shiffman, & Raynor, 2003). An important consideration involves the possibility that the wide variety of laboratory stressors used in studies of social support and stress responses may not adequately represent the types of stressors individuals encounter in their natural environments. These studies highlight the complex nature of the social support-stress relationship, and suggest that contextual factors greatly influence study findings. In particular, the variability in person-situation aspects of support seeking and stress suggests that a crucial direction is to measure naturally-occurring social contexts and processes.

Studies which employ complex methodologies and statistical modeling procedures to examine stress processes in the natural environment sometimes produce

findings that differ markedly from the findings produced by studies that assess the same phenomena in a laboratory setting. For example, Vella and colleagues (2011) found no evidence for a relationship between trait hostility and ambulatory blood pressure when examining averaged (i.e., between-persons) effects. When the authors tested the same hypothesis using multilevel modeling methods to model between-person effects on within-person processes of social support and cardiovascular responses, there was evidence that trait hostility is associated with increased blood pressure during social interactions, and further, that hostility attenuated the typically stress-buffering effect of instrumental forms of received social support. There is a clear need to examine social support and stress processes in the natural-environment to (1) provide more evidence for the complex effects of social support on cardiovascular responses outside the laboratory, and (2) determine whether evaluations of social interactions as stressful influences the magnitude of cardiovascular response.

Inadequate Theory Building

The second explanation offered by Uchino and his colleagues to account for the lack evidence supporting mediating psychological mechanism is that hypotheses guiding this work have been derived from a narrow range of theoretical perspectives. Researchers generally have seemed reluctant to test other intriguing theories or to develop new ones. One promising new direction has been developed by Lakey and Orehek (2011), who argue that beliefs about social support develop gradually through the context of mundane, day-to-day interactions, and social support may be received in this way as well. In this framework, support can reflect the simple, often implicit, acknowledgement that people around me care, and want to support me.

As Uchino and colleagues suggest, evidence from the wider body of social support literature may help suggest new directions and hypotheses for investigating potential psychological mechanisms. An equally important task is to place social support in the context of other theories of health and stress. As noted above, studies examining social support and stress have typically used a Stress-Buffering Theory approach which has failed to generate compelling evidence for psychological mediation through suggested pathways involving more adaptive appraisals and reduced emotional responsivity to stressors. Other theories of social support and health posit different mechanisms which should be evaluated empirically in the context of physical health.

For example, research by Lakey and Orehek (2011) seeks to explain the elusive association between perceived social support and positive mental health. This perspective conceptualizes perceived social support as a primarily implicit regulator of affect, thought, and action, which mediates the effect of perceived social support on mental health outcomes. Lakey and Orehek propose novel study designs and conceptualizations of individuals within support networks that seek to account for differences in individuals' normal behaviors (affect, cognitions, actions) in comparison to relationally-regulated (i.e., different from one's normal) behavior. These investigators suggest that perceived social support may regulate social relationships largely in automatic and implicit ways through "affectively consequential" relational situations. As Uchino and colleagues note, a "relational" approach to emotional regulation suggests promising new directions by offering implicit processes which may be influenced by perceived social support and thus come affect health outcomes. Further study of such processes seems warranted.

"Implicit" Support Processes

Uchino and colleagues' third explanation for the lack of evidence supporting mediating mechanisms points to the controversial possibility that there are no psychological mechanisms, or that theories need to redefine the "psychological" processes that may account for the relationship between social support and health. Uchino and colleagues mention hypotheses proposed by House and his colleagues which suggest that social support may shape motivation, emotion, and neuroendocrine processes directly and nonconsciously (House, Landis, & Umberson, 1988). Yet, another possibility is that *implicit* psychological mechanisms may be at work. Uchino (2009) indicates that this view understands perceived social support as a developmental process growing out of attachment-relationships in childhood (e.g., Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1982). Attachment theory postulates that accrued experiences with attachment figures leads to the development of internal working models of self in relation to others which become closely represented in neural circuitry and explain the general consistency of attachment over the life course (Bowlby, 1982; Rothbard & Shaver, 1994). Attachment theory postulates close connections between social learning and emotional regulation which are represented in neural connections and result in automatic processing of the social environment, a notion which has received empirical support from neural imaging studies (Gillath, Bunge, Shaver, Wendelken, & Mikulincer, 2005). Accordingly, one hypothesis offered by Uchino and colleagues is that the effects of perceived social support on health represent automatic processes which are difficult to measure. They suggest further that the processes reflected in these potentially implicit mechanisms may result in individuals being hesitant or unable to adequately report these processes.

Uchino and his colleagues suggest further that the effects of implicit social support mechanisms on cardiovascular health outcomes may be difficult to detect because perceptions of social support may exert stronger effects on cardiovascular responses in specific social situations. Consistent with the conceptualization of perceived social support as corresponding to an internal working model of self-other relationships, we would expect that this implicit process becomes activated most strongly when a person must navigate social relationships. Although historically studies have primarily examined *either* perceived or received social support (Uchino et al., 2012), recent research has examined how perceived and received social support work together to predict cardiovascular responses. Schwerdtfeger and Schlagert (2011) report evidence that perceived social support is unrelated to cardiovascular reactivity during a laboratory stressor except in situations where social support is present. In situations where social support is not present, a person's cardiovascular responses are unrelated to the individual's level of perceived social support. However, when social support is present, only those individuals who report high levels of perceived social support benefit from stress-buffering by showing decreases in heart rate, mean arterial pressure recovery, as well as increased heart rate variability and baroreceptor reflex sensitivity. These findings support the notion that the stress-process unfolds differently depending on whether one judges oneself to be the beneficiary of high versus low levels of perceived social support, and whether one engages in a social interaction where support may or may not be present. Schwerdtfeger and Schlagert's findings highlight the importance of understanding not only how perceived social support confers health, but also for *whom*, and *when*.

Although Schwerdtfeger and Schlagert's findings are compelling, the limitations of the design do not permit strong conclusions and further investigation is warranted. The authors employed participant self-assignment to either the support versus alone condition, and utilized a stressor which entailed a three-minute speech on personal strengths and weaknesses. The authors argue that self-selection was important to the study design given the necessity of having participants ask a support person to accompany them. One important limitation of this design is that participant personality is confounded in the self-selection bias; individuals who elected to participate in the social support condition may be more likely to seek support in their natural environment, and may also be more likely to have support figures they can readily rely on, and may also be less stressed or self-conscious about sharing personal details in front of others. Hence, the findings are confounded by these important individual differences; further research employing random assignment is necessary to determine the unique effects of social support as different from these other possible explanations.

Summary

New directions and approaches to the study of social support and health clearly are needed. Uchino's careful review indicates the need to: (1) make use of strong study designs and statistical analyses that can adequately address the question of mediation, (2) consider alternative theoretical explanations, and (3) widen our focus to include implicit processes that operate in specific social situations. While these concerns focus specifically on the question of psychological mediators, the literature also raises important questions about traditional approaches to conceptualizing the role of social support in health more broadly.

Specifically, the dominant perspective has sought to determine if people who do or do not have support exhibit higher or lower levels of physiological stress. This approach has been largely "reactive" in seeking to identify individual factors that predict stress reactions. Yet, an equally important set of questions concerns the psychological factors that cause individuals to come into contact with stressors in their everyday environments, and how these factors operate in the context of daily social interactions. For example, why do variations in study designs, support types, stressor types, and contextual differences produce markedly different patterns of physiological stress responses? This question usually has been framed as a problem of accounting for variations in individual response tendencies. But it also could be framed as a problem of understanding how differences in personal motives cause individuals to perceive and use supportive relationships and environments in differing ways, and how these differences may affect physiologic responses to stressors. A social-motivational perspective view is helpful in this regard, as it views individuals as active agents who continually seek shape their social world as well as to reactively adapt to it. Focusing on the goals and intentions of individuals may further enhance our understanding of support-stress relationships as it allows us to ask important questions about how people create, engage, or avoid, stressful social environments.

A Social Action Theory Approach

Social action theory (e.g., Ewart, 1991; Ewart et al., 2011, 2012) offers a social-motivational analysis of chronic stress exposure that may prove helpful in addressing perplexing questions in the social support literature. Existing models of social support ask important questions about the mechanisms by which perceived social support affects

physiological responses. While these reactive-response regulation models have yielded complex descriptions of the nature by which social support affects stress responses, a key challenge is to explain how these stress responses occur frequently enough or long enough to generate chronic illness. Social action theory affords an integrative model of human stress and resilience which explains chronic stress by identifying key cognitive, behavioral, and socio-emotional determinants of stress exposure, stress interpretation, and regulation of psychological and physiological response.

A social action theory analysis of chronic psychological stress proposes that such stress has two distinct aspects: (1) how one comes into contact with stressful events/situations, and (2) how one regulates the situation and/or physiological responses to it. In the social action view, a living organism is much more than a collection of physiologic processes; it is a distinct entity with needs and goals. As an organism seeks to meet its needs by pursuing goals, it must be able both to act upon its environment while also regulating the environment's impact on the organism. Events or conditions that impair the organism's ability to engage the environment while modulating its impact are said to be "stressful." Social action theory delineates two qualitatively different pathways to chronic stress. First, an impairment of self-directive capabilities can causes one to repeatedly engage one's environment in maladaptive ways that generate stressful experiences. Second, an impairment of self-regulatory capabilities can result in inadequately regulated psychological and physiological responses to stressful situations and environments, resulting in elevated and prolonged responses to stress. Either mechanism – but especially the combination of both – has the potential to repeatedly trigger and chronically sustain health-damaging physiological stress responses. This

social-motivational analysis differs markedly from the prevailing theoretical approach to social support and stress—an approach that has focused on factors that change the stress-response, rather than on factors that foster engagement with stressful situations in the first place, or that help sustain contact with stressful environments.

Consistent with the suggestions of Uchino and colleagues (2012), the social action theory perspective suggests that important goals and regulatory mechanisms which affect stress and health are often *implicit* in nature. The social action theory view was developed, in part, out of observations that self-report and behavioral observation of psychologically important constructs often show different patterns of relationships with health outcomes. For example, whereas self-reported goals often are modestly correlated with observers' ratings, cardiovascular disease risk is only predicted by observers' ratings (e.g., Ewart, Elder, & Smyth, 2012). This perspective is derived from an embodied cognitions perspective which posits that cognitive representations of goals and intentions that guide everyday action are "embodied" neurologically (e.g., Gallese, 2009), preventing the need for taxing and intensive cognitive processing of possible responses in every situation encountered. It is not suggested here that these processes are somehow hidden from awareness, but that many activities (e.g., social interaction) are guided by typical and implicit patterns of responding.

Whereas goals generate stress directly – by shaping the frequency and character of social encounters – self-regulatory capabilities affect stress processes more indirectly by magnifying or attenuating an individual's response (i.e., magnitude, duration) to the event. The social action view suggests that, like our motives, many of our self-regulatory capacities operate implicitly and are developed over time through modeling and practice.

One primary self-regulatory capacity involves implicit emotion regulation. Implicit emotion regulation is typically defined as "any process that operates without the need for the conscious supervision or explicit intentions, and which is aimed at modifying the quality, intensity, or duration of an emotional response" (Koole & Rothermund, 2011, p. 390). Furthermore, research indicates that implicit processes of emotion regulation are often driven by goal-oriented action such that they tend to operate most strongly when an individual engages in goal-directed behavior (Hopp, Troy, & Mauss, 2011). Accordingly, social action theory posits that although implicit goals and implicit self-regulation capabilities are important independent contributors to chronic stress, the combination of the two will more strongly predict adverse health outcomes.

Empirical Support

The social action theory framework led to the development of the Social Competence Interview (SCI), a structured stressinterview which is situationally-grounded in the individual's typical experiences of stressful events (Ewart, Jorgensen, Schroder, Suchday, & Sherwood, 2004). The SCI allows for behavioral coding of the implicit motives (i.e., goal-oriented strivings) and expressive behaviors involved in people's attempts to resolve future stressors. Empirical validation of social action theory includes evidence supporting three distinct motive profiles (Ewart, Elder, Smyth, Sliwinski, & Jorgensen, 2011; Ewart & Jorgensen, 2004; Ewart, Elder, Laird, Shelby, & Walker, 2013): the agonistic motive profile (high agonistic goals, low transcendent goals, high emotional expressiveness), the transcendent motive profile (low agonistic goals, high transcendent goals, high emotional expressiveness), and the dissipated motive profile ((low agonistic goals, low transcendent goals, low emotional expressiveness). The ways

in which individuals with these motive profiles contact stress is different. For agonistically-focused individuals, stress is related to interpersonal struggles, as they attempt to resolve or avoid stressful experiences by controlling *others*. For transcendent-focused individuals, stress is related to desirable self-goals, and reflects attempts to control the *self* in pursuit of these goals. For dissipated individuals, stress is manifested by the inability to generate plausible or workable goals for resolving recurrent stress.

Empirical research has supported the social action theory hypothesis that agonistic motives are a socio-cognitive mechanism that shapes cardiovascular responses. Agonistic motives have been linked to greater cardiovascular stress responses observed in the laboratory (Ewart & Jorgensen, 2004) as well as higher ambulatory blood pressure levels measured in the natural social environment (Ewart, Elder, Smyth, Sliwinski, & Jorgensen, 2011; Ewart & Jorgensen, 2004). Increasing evidence also suggests that self-regulatory capacities modulate the impact of the agonistic motive profile on ambulatory blood pressure. For instance, agonistically-focused individuals with the ability to generate positive affect following an anger incident had lower ambulatory blood pressure levels (Ewart et al., 2012). A recent study provided evidence that adolescents' self-regulatory abilities observed in the natural environment by teachers (indexed by adolescents' internalizing, externalizing, and self-control behaviors in the classroom) amplified or attenuated the effect of agonistic goals on ambulatory blood pressure (Ewart, Elder, & Smyth, 2012a).

Prior research also supports the notion that goal-oriented strivings shape both interpretations of people we interact with, and further, guide behavior during interactions (Chen & Matthews, 2001; Chen et al., 2002). Ewart and Jorgensen (2004) reported

evidence that, while recounting a personally-important stressor, agonistically-focused individuals tend to be evaluated more negatively by observers, on whom they tend to have a more adverse social impact.. Agonistic individuals are rated by independent observers as less socially competent and appearing more hostile, critical, oppositional, and aggressive. Social action theory suggests that agonistically-focused individuals are more likely to have conflictual social relationships marked by coercive attempts to get others to change. Further, they are more likely to evaluate others as unhelpful, and to experience heightened psychological as well as physiological stress during social interactions.

Perceived Social Support as an Implicit Self-Regulatory Mechanism

The social action theory perspective conceives of *perceived* social support as a regulatory capacity or resource; the level of perceived support indexes one's self-perceived ability to elicit desired responses from others in one's social network. Perceived social support reflects the belief that others will respond to one's personal desires or needs, and support one's personal strivings. When a person enters an interpersonally stressful situation, they implicitly draw upon internal representations (i.e., cognitive schemas) of others as helpful and supportive, which decreases the likelihood that the person will perceive others as having ill-intentions, or as needing to be controlled or managed, thereby decreasing the likelihood of interpersonal conflict (Collins & Feeney, 2004) and impairment to problem-solving capabilities (Mikulincer, Shaver, & Roy, 2011). Perceptions of social support thus represent a self-regulatory resource upon which one can draw when trying to modulate the emotional and physiologic impact of environmental stressors. Recent studies examining the effect of activating schemas of

supportive others on cardiovascular reactivity indicate that those who think about a supportive other before an anger recall, mental arithmetic, or speech task display reduced cardiovascular reactivity (Carlisle, Uchino, Sanbonmatsu, Smith, Cribbet, Birmingham et al., 2011; Creaven & Hughes, 2012; Ratnasingam & Bishop, 2007). These authors conclude that implicit activation of important positive and negative social ties may be a mechanism by which interpersonal stress induces higher cardiovascular responses (Carlisle et al., 2011). These studies support the notion that perceived social support implicitly influences social behaviors, emotions, and physiological responses in the manner proposed by social action theory.

The Present Study

The current study investigated the social action theory hypothesis that perceived social support indexes a regulatory capability that enables individuals to modulate the impact of naturally-occurring social-stressors on emotional and cardiovascular outcomes. To address this question, ecological momentary assessment and ambulatory blood pressure monitoring were employed to examine the effects of agonistic motives and perceptions of social support on interpersonal *processes* over the course of two days in participants' natural social environments. The study design allowed for tests of both hypothesized relationships between perceived social support and agonistic motives on cardiovascular disease risk through the proposed mechanisms of reducing the frequency and severity of subjective reports of stress experienced while interacting with others.

Hypotheses

The primary aims of this study were to evaluate the role of between-person differences in agonistic motives and perceived social support in predicting within-person

processes of interpersonal stress and cardiovascular responding. There were three major hypotheses. First, the central hypothesis was that agonistic motives increase the magnitude of association between interpersonal stress and ambulatory blood pressure levels. Support for this hypothesis would provide evidence that motives magnify the physiological stress-response to interpersonally-induced stress. Second, perceived social support was hypothesized to also attenuate the association between interpersonal stress and cardiovascular activity. Support for this hypothesis would extend previous findings generated in laboratory paradigms to the natural environment. Third, perceived social support was hypothesized to serve as a regulatory mechanism which reduces the impact of agonistically-induced interpersonal stress on cardiovascular responses. Support for this hypothesis would provide further evidence that regulatory mechanisms alter motive-induced stress.

In addition to testing these central hypotheses, this study afforded the opportunity to test two ancillary hypotheses. First, social action theory suggests that agonistically-focused individuals foster interpersonal conflict; this study also provided an initial evaluation of the hypotheses that agonistic individuals are more likely to experience higher interpersonal stress. Second, the present study also evaluated the stress-buffering hypothesis by testing whether agonistic motives predict a stronger association between negative affect and blood pressure, and whether this relationship was attenuated by perceived social support.

Methods

Participants

Participants were part of Project Heart 6, a follow-up study of young adults who participated in Dr. Craig Ewart's first three Project Heart studies of psychosocial contributors to cardiovascular risk in low-income urban youth. Conducted in Baltimore, Maryland, between 1987 and 1999, Project Heart studies 1, 2, and 3 implemented a sequence of risk assessment, observational, and experimental studies at two Baltimore public "magnet" high schools that drew students from all neighborhoods of Baltimore City. In 2006, Dr. Ewart was awarded an R01 grant from the National Heart, Lung, and Blood Institute of the National Institutes of Health to locate former Project Heart participants and enroll as many as possible in a new study. Tracing of former participants was performed by a tracing team at the Battelle Memorial Institute in St. Louis, MO; the tracers were able to locate a large proportion of the individuals who had participated in one of the three earlier studies. Of 658 former participants, the Battelle tracers managed to contact 386 individuals (59%). Of those traced, 16 were ineligible due to death or military service, and 18 (5% of those contacted) were not interested in learning about opportunities to participate in new health research. Of the 352 former participants who wished to learn about new research participation opportunities, the Project Heart staff was able to conduct an initial informational telephone interview with 280 (80%). A total of 265 of these individuals enrolled in the Project Heart 6 follow-up study. Of this group, 223 (63% of all individuals willing to be contacted by the Project Heart team) were able to attend laboratory assessment sessions at the Johns Hopkins University medical center in Baltimore. Of this group, 195 were able to complete the ambulatory blood pressure and

ecological momentary assessment portion of the study following completion of the laboratory portion of the study. Participants were 75% female, and 63% Black, and ranged from 26 to 38 years of age. As incentive, participants who completed the entire study were offered $300. The large proportion of female participants was a consequence of the fact that Project Heart 2 investigated cardiovascular disease risk in Black adolescent females, and thus employed an all-female sample.

Procedure & Apparatus

Data collection proceeded in two phases. First, participants attended the Project Heart laboratory at Johns Hopkins to complete questionnaires, assessment of anthropometric features, and participate in the Social Competence Interview (SCI). Immediately following this visit, they participated in ecological momentary assessment and ambulatory blood pressure (ABP) monitoring in the natural environment for a 24-hour period. Participants later returned for a second visit to complete other study materials and procedures (not used in this study); immediately following this visit, participants completed a second phase of ecological momentary assessment and ABP monitoring.

Laboratory assessment. Upon arriving at the lab, the participant was seated in a comfortable chair and informed of study procedures. After informed consent was obtained, the experimenters administered a battery of questionnaires, followed by the SCI, and measurement of anthropometric features (e.g., height, weight).

Social competence interview (SCI). The SCI is short, 10-minute behavioral assessment protocol that measures participants' goal-oriented strivings, social skills, and interpersonal style, and also serves as a potent social stressor to elicit cardiovascular

responses (see Ewart, Jorgensen, Suchday, Chen, & Matthews, 2002). The interview began by stating that the purpose of the interview is to find out how everyday problems affect blood pressure. The participant was then presented with six cards, each listing a major stress category (school, friends, family, neighborhood, money, work) and examples of common problems. Participants were instructed to sort the cards from most to least stressful. The interviewer then asked why the top card was chosen, and established whether it represents a stressor that was (a) emotionally evocative, and (b) continues to recur.

The 10-minute interview protocol is divided into a "hot" phase and a "cool" phase, each of which lasts 5 minutes. During the initial hot phase of the interview, the interviewer helped the participant recall, describe, and vividly re-experience an important personal stressor. The interviewer began by asking the participant to explain why s/he chose that problem, and to describe a recent occasion when the problem occurred. The interviewer assumes the role of a sympathetic listener, and uses a standard set of probes to assess various aspects of the situation (e.g., "What happened next?" "How did you feel?" "What was going through your mind?"). During the second half, or cool phase, the interviewer asked the participant to pretend that s/he is a movie director making a film about a person like the participant who has a similar problem. The interviewer invites the participant to invent a desirable but realistic ending for the imaginary film, and then to craft a film narrative that leads to the desired conclusion. The interviewer then returns to the problem situation the participant described and asks how the imaginary film story might apply to that problem. If the problem occurs again, would the participant strive for an ending like that in the film? The interviewer asks the participant to focus on his or her

favored solution to the problem, the strategies that s/he might use to achieve that solution, and the consequences that s/he might expect to experience upon trying that approach.

Ecological momentary assessment. Following laboratory procedures, participants were introduced to the two-day ABP monitoring protocol and ecological momentary assessment (EMA). Following instructions, they were supervised as they completed their first ABP reading and EMA survey.

Ambulatory blood pressure monitoring. Participants were fitted with a Suntech Medical Oscar-2 Ambulatory Blood Pressure Monitor. This device consists of a small monitor held by a sling-holster, and a blood pressure cuff which was fitted to the participant's non-dominant arm. Participants were told that the cuff will inflate periodically throughout the day, and instructed to refrain from using the cuffed arm while it operated. The experimenter then triggered the monitor to accustom them to the equipment and answered any questions. Participants were asked about their typical sleep-wake times and the Oscar-2 was programmed to take a BP reading every 30 minutes during waking hours and once every hour during sleep.

Daily diaries. The EMA data collection was conducted using personal electronic organizers (Palm Zire 22™) which were programmed using Satellite Forms Application Designer™ to load questionnaires. Participants were told that they would be alerted to answer questionnaires by an alarm which would beep approximately every three hours. At this time, they responded to questionnaires regarding interpersonal stress experienced over the past three-hour period. They were also instructed to respond to a set of questionnaires when the cuff inflated. At this time, they answered questions about

posture, activity, affect, and whether they were interacting with someone in the 10 minutes preceding the cuff's inflation.

Measures

Covariates. Important covariates included standard anthropometric influences on cardiovascular measurements as well as activities recorded during ecological momentary assessment. Body mass index was calculated as weight/height^2 (kg/m^2). Circumference of waist and hips was measured by a trained confederate and measured in inches. During ecological momentary assessment, participants responded to a survey each time their blood pressure was measured. They were asked to indicate their current position (lying down, sitting, standing/on feet), activity level (standing/still, walking/stairs, running/breathless), and consumptions in the past 10-minutes (i.e., food, caffeine, alcohol, and cigarettes), and whether they were interacting with other individuals.

Between-subjects measures.

Agonistic motive profile. The agonistic motive profile was assessed using the procedures outlined by Ewart and colleagues (2011) which include behavioral coding and cluster analysis. Agonistic and transcendence goals, as well as emotional expressiveness were assessed using the SCI behavioral coding protocol (Ewart et al., 2002; Ewart, Ditmar, Suchday, & Sonnega, 2007). Agonistic goals were assessed with items that assess the individual's tendency to strive in self-defense (e.g., "wanting someone to stop making demands on him/her") and affiliation (e.g., "wanting someone to like him/her"). Transcendence goals were assessed with items that assess the individual's tendency to strive for self-improvement (e.g., "trying to achieve a self-standard that is important to him/her personally"). Emotional expressiveness was assessed with 10 items which index

the individual's expressive speech characteristics (e.g., "speaks emphatically", "voice easily expresses emotion", "speaks rapidly"). These scales have high internal consistency across studies (e.g., Ewart et al., 2002; Ewart et al., 2011), and have adequate temporal stability over a three-month period (Ewart et al., 2002). Items that comprise the agonistic, transcendence, and emotional expressiveness scales are shown in Appendix A. The cluster analysis procedure will be discussed in the analysis approach section, below.

The interviews were audio-recorded and coded by graduate students trained by Ewart. Approximately 50% of the interviews were independently rated by at least two coders. Inter-rater reliability scores were calculated using procedures as previously published (Ewart et al., 2002). Pearson product-moment correlations among pairs of raters were in the acceptable range: .84 to .94 for agonistic strivings, .92 to .99 for transcendence striving, and .90 to .99 for emotional expressiveness.

Perceived social support. The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet, Dahlem, Zimet, & Farley, 1988) consists of 24 items which ask the participant to rate on a 5-point Likert-type scale the degree to which they perceive social support to be available from family, friends, and significant others (e.g., "I get the help and support I need from my friends"). The PSSS has adequate internal consistency (Cronbach's alpha = .88) and test-retest reliability (.85) over a two to three month period (Blumenthal, Burg, Barefoot, Williams, Haney, & Zimet, 1987). Although subscales for family, friends, and significant others have been validated using factor-analysis, the present study used the total PSSS scale. Items and instructions found in Appendix B. The three subscales had modest to high intercorrelations, $r(195)$ between .40 and .45, all $p <$ .01.

Within-subjects measures. Within-person measures were administered multiple times per day by daily diary (ecological momentary assessment) at intervals specified below. Within-subjects measures can be found in Appendix C.

Interpersonal stress. Interpersonal stress was assessed six times per day on a three-hour schedule. Participants were asked to reflect on interpersonal experiences over the previous three hours and indicate on a seven-point scale how "stressed" they felt while interacting socially. These items were summed to create the interpersonal stress variable.

Negative affect. Negative affect was assessed as part of the blood pressure survey, which participants completed after the Oscar-2 had completed taking a blood pressure measurement. Using a seven-point scale, participants reported the degree to which they felt "angry/upset" and "sad/discouraged" in that moment. These items were summed to create the measure of negative affect.

Data Analysis

Data quality. Overall compliance for this study was moderately high. The 195 individuals who participated in the ABP-EMA portion of the study produced a total of 3,212 readings; the average person produced 17 matched records (SD = 10). Noncompliance throughout the study period was partially accounted for by occasional Oscar malfunctions, bathing, sleep-cycle differences, and variation in study start time.

Detection of errors and outliers. The Suntech Medical Oscar 2 indicates erroneous readings based on a number of built-in algorithms to identify potential equipment malfunction. All readings with associated air leaks, microphone difficulties, or weak/absent oscillometric signals were removed from the data set. To eliminate

extraneous values not captured by the Oscar 2, the criteria provided by Marler and colleagues (Marler, Jacob, Lehoczky, & Shapiro, 1988) was applied. These criteria specify removal of measurement occasions where: SBP values are above 250 mm Hg or below 70 mm Hg, DBP values are above 150 mm Hg or below 45 mm Hg, SBP/DBP is great than three or less than (1.065 + 0.00125*DBP). This data cleaning resulted in removal of approximately 13% of readings (sample mean and average individual).

Cluster analysis. A combination of hierarchical and *k*-means cluster analysis methods was used to replicate earlier findings regarding the structure of the motive profiles from expressiveness and agonistic and transcendence strivings. The combined approach is the recommended and most stringent approach (Aldenderfer & Blashfield, 1984; Wishart, 2006). Hierarchical cluster analysis using Ward's method (i.e., increase in Sums of Squares) starts with each individual as a distinct cluster. Each subsequent iteration combines these "individual" clusters one by one, maximizing between-group variation while minimizing within-group variation. The hierarchical procedure results in a classification tree that defines cluster membership at N-1 clusters. The resultant classification tree is then validated against multiple subsamples using bootstrapping (with replacement) to identify the most robustly supported number of clusters.

The resulting centroids (i.e., multidimensional mean) produced by the hierarchical cluster analytic procedure are then used as the seeds (i.e., starting points) for a *k*-means cluster analytic procedure, again using Ward's distance method. A *k*-means approach allows for a validation of cluster membership. While the hierarchical method assigns each case its own cluster and proceeds to maximize between-cluster variance, a *k*-means approach assigns each case to the nearest cluster seed. In essence, the hierarchical

procedure uses a bottom-up approach to defining the best number of groups allowing maximum separation of individuals, and the multidimensional-mean for each of the groups; the *k*-means approach takes these groups, and assigns each individual into the best-fit, given his/her score on all of the measures.

Multilevel analysis. Multilevel modeling (PROC MIXED, SAS Version 8, SAS Institute, Cary, NC) was used to test hypothesized relationships between agonistic striving, perceived social support, interpersonal stress, and cardiovascular activity. This approach allows for simultaneous testing of between-person and within-person hypotheses, and specification of cross-level interactions between within-person level relationships and between-person individual differences. It also allows for modeling of autocorrelation effects, handling unbalanced designs and nonequivalent time periods, and appropriate handling of missing data using a maximum-likelihood estimation procedure.

In this study, complex within and between-persons variance were modeled on three levels. Ambulatory blood pressure measurements taken every 30 minutes were considered "Level 1", indicating they are the lowest order, and finest-grain measurement. Interpersonal stress was measured every three hours and was considered "Level 2", because there will be up to six Level 1 (i.e., ABP) measurements within this level. Between-persons measurements (i.e., agonistic motives and perceived social support) are considered the highest order measurement, "Level 3". In this frame, each level is considered to be "nested" within the higher order variables. For instance, ABP measurements are nested within moments of interpersonal stress; both are nested within individuals (who are characterized by between-person differences in agonistic motives and perceived social support.

This multilevel approach allows lower-order variables to be modeled at higher-order levels. Within-person moments of interpersonal stress (level 2) were also considered as an individual difference variable (level 3) describing a person's tendency to experience interpersonal stress. The ability to model variables across levels also confers the ability to transform questions about how higher and lower-order variables interact. Random *intercepts* models allow for the tests of hypotheses about relationships within a given level. For example, a Level 3 random intercept model question was "is an agonistic motive profile associated with higher ABP?" A Level 2 random intercept question was "are higher moments of interpersonal stress associated with higher ABP?" Using random *slopes* models, we can ask questions about how higher-order variables *interact* with lower order variables; for example, a random slopes regression allowed for the test of the hypothesis "are differences in the *relationship* between interpersonal stress and ABP predicted by agonistic motives?" In essence, this model considered ABP at level 2 with interpersonal stress, and asked whether agonistic motives (i.e., level 3) predict the relationship (i.e., slope) between interpersonal stress and ABP (i.e., at level 2).

Repeated level 1 ABP measurements were regressed on predictors at multiple levels (e.g., level 2 interpersonal stress, level 3 agonistic striving) as well as individual difference and time-varying covariates. All models were estimated using the Full Maximum Likelihood (FML) estimation method which can handle missing data and unbalanced designs, and allows for flexible comparison of models which change in composition of both fixed and random effects (Hox, 2010). The intercept as well as time-varying predictors and covariates were modeled with random coefficients. With more complex models, the time-varying covariates were modeled as fixed effects to reduce

model complexity. The covariance model was specified as unstructured which allowed the variance and covariance parameters to be estimated from the data pattern. This also allowed for the specific autoregressive qualities of frequent ABP measurements to be appropriately modeled (and thereby accounted for by the model). All continuous variables were person-centered such that all fixed-effects (between-persons) were centered on the grand-mean and all time-varying variables were centered on the individual's total mean for the sampling period. Outcome variables and categorical variables were not centered. This is the recommended approach to allow for ease of interpretation of effects across levels (Hox, 2010; Singer, 1998; Singer & Willett, 2003).

Separate models were specified for ambulatory Systolic (SBP) and Diastolic (DBP) Blood Pressure. For each of these outcomes, the first models specified an empty model to allow for estimation of the Intraclass Correlation (ICC) which identifies the proportion of variance attributable to a given individual's average (between-persons) compared to the residual (within-persons) variance. This allowed for determination of whether there was a reasonable amount of within-person residual variance to attempt to explain using the hypothesized predictive models. Next, between-persons and time-varying covariates were added to the model to evaluate their influence on ABP. Once a suitable covariates model was selected, these covariates were included in all subsequent tests of hypothesized models.

To test the hypothesized series of moderation effects, the first models examined the influence of Interpersonal Stress on ABP. A second set of models examined whether the Agonistic Motive Profile moderated the effect of Interpersonal Stress on ABP. A third set of models examined whether Perceived Social Support moderated the effect of

Interpersonal Stress on ABP. A fourth set of models examined whether Agonistic Motives and Perceived Social Support had a combined moderation effect on the association between Interpersonal Stress and ABP.

Results

Cluster Analysis

First, the intercorrelations among the social competence interview scales were computed to determine whether there was a similar pattern observed in previous studies. Expressiveness was positively correlated with Self-Defense Striving (SD), $r(195) = .15$, $p < .05$, and Self-Improvement Striving (SI), $r(195) = .17$, $p < .01$; but was not related to Affiliation Striving (AF), $p = .12$. Self-Defense Striving was correlated with AF, $r(195) = .31$, $p < .01$, and negatively associated with SI, $r(195) = -.31$, $p < .01$. Affiliation Striving was not associated with SI. As with previous studies, Approval-Seeking goals were not correlated with the other scales, all $p > .30$.

Results of the hierarchical cluster analysis and subsequent model validation procedure supported a three-cluster solution. Following the *k*-means cluster analysis to define cluster membership, the results were plotted on the variables used to define the clusters. Results from the combined hierarchical and *k*-means approach revealed a strikingly similar pattern to those found in Project Heart 3 (Ewart & Jorgensen, 2004) and Project Heart 5 (Ewart et al., 2011), as well as in two studies which included adults (Ewart et al., 2013; Maisto, Ewart, Witkiewitz, Conners, Elder, Krenek, & Ditmar, 2014). The present cluster profiles clearly fit the predicted agonistic, transcendence, and dissipated motive profiles. Cluster 1, “agonistic motive profile”, was characterized by high scores on expressiveness and agonistic goals (self-defense, affiliation), and low

scores on transcendence goals (self-improvement); Cluster 2, “transcendence motive profile”, was characterized by high scores on expressiveness and transcendence goals, and a low scores on agonistic goals scales; and Cluster 3, “dissipated motive profile”, characterized by a low scores on expressiveness and moderate scores on agonistic and transcendence goals.

The clusters obtained from the present study sample in Baltimore, shown on the right of Figure 1, are juxtaposed with the corresponding cluster profiles obtained earlier in a Baltimore sample containing some of these individuals when they participated in Project Heart 3 as adolescents (left), and a later sample of adolescents who participated in Project Heart 5 in Syracuse, NY (middle). The present cluster profiles clearly fit the predicted AS, TS, and DS patterns, and closely approximated the corresponding cluster profiles obtained in previous studies. Of the 195 participants in the present study, 28% fit the Dissipated Motive Profile, 34% fit the Transcendence Motive Profile, and 38% fit the Agonistic Motive Profile. Chi-square tests indicated that the three clusters did not differ significantly with respect to gender or race (all values of $p > .15$).

Descriptive Statistics and Influence of Covariates

Table 1 displays means of each study variable at the between-person level for the total sample as well as differences between Motive Profile group. The DS group had significantly higher BMI as compared to the AS group. There was a tendency for the DS group to have larger Waist Circumferences (WC) as compared to both the AS and TS groups; however, these results did not attain statistical significance, both $p = .08$. When the DS mean was compared to combined AS/TS mean, there was evidence that the DS group had a significantly higher WC, $t(194) = 2.00$, $p < .05$. The AS group tended to

report sitting more than, and lying down less than, the TS group. The DS group had a higher between-persons group mean on Ambulatory DBP compared to the AS group. There were no significant differences among groups in terms of age, proportion of measurements associated with social interaction, on-feet activity level, or consumption of tobacco, caffeine, food, or alcohol. There were no significant differences among Motive Profile groups in terms of between-person level Interpersonal Stress or Perceived Social Support. The DS group had a higher between-person level of ambulatory DBP than the AS group. Results of between-person level correlations (see Table 2) indicated that Interpersonal Stress was associated with a higher proportion of social interactions over the course of the study. The relationship between IS and proportion of readings where the person consumed alcohol was positive but did not attain statistical significance, $p = .08$. Perceived Social Support was associated with lower IS, more social interactions, and fewer occasions of tobacco use. The relationship between PSS and between-person level ambulatory SBP was negative, but not attain statistical significance, $p = .09$.

Multilevel Models[1]

Empty models. First, empty models were fit separately for ambulatory SBP and DBP to determine baseline model fit (i.e., to assess whether subsequent model significantly improved explanatory power of the model) and the proportion of explainable variance at each level. Calculation of Intraclass Correlations (ICC; see Table 3) indicated that the between-persons individual differences accounted for 49.9% of variation in SBP, 33.1% in DBP, 49.0%. Empty models were then fit which allowed variation in ABP at Level-2 (i.e., over 2.5 hour Beep intervals). These models indicated a range of 13-18% variation at Level-2 across ambulatory outcomes (see Table 2). A

[1] Statistical equations for all models can be located in Appendix D.

likelihood ratio test indicated that a significant improvement in model fit for the three-level model (see Table 4, 1 vs. 4).

Influence of covariates. To examine the influence of time-varying covariates, two-level models were fit which estimated the fixed and random coefficients of position and consumption of tobacco, caffeine, and alcohol. Results indicated significant associations between position and consumption of food on ABP (Table 5). Tobacco use was associated with an increase in DBP, but not SBP. Alcohol and caffeine did not have a statistically significant association with ABP. A reduced model of the time-varying covariates retained all variables except caffeine and alcohol consumption. A Likelihood ratio tests indicated that, compared to the empty models, both covariate models significantly improved model fit (Table 4), and the reduced model did not significantly differ from the full-covariates model (Table 4; 2 vs. 3).

Next, the influence of between-person covariates was added to the reduced covariate model to determine their influence on the ambulatory measures. The likelihood ratio test indicated a further improvement in model fit when adding between-persons covariates (4 vs. 5). The final model of covariates included BMI, sex, and age as well as position and consumption of tobacco and food at the time of measurement[2].

Reduced models which did not include the random coefficients of time-varying covariates (position, tobacco, food consumption) were also evaluated in terms of model fit to determine whether they improved model fit above the baseline models. Likelihood ratio tests indicated significant improvement in model fit over the empty three-level

[2] Waist Circumference and Waist-to-Hip Ratio were also considered as covariates. All models were tested substituting each of these variables for BMI; there were no substantive changes in associations or interpretations.

model; however, there was also a significant reduction in model fit compared to models which included random coefficients for time-varying covariates (4 vs. 7, 6 vs. 8).

The Influence of interpersonal stress on cardiovascular activity. The first set of predictive models examined on the influence of Interpersonal Stress (IS) on ABP. The first model examined the influence of between-persons (Level-3, grand-mean centered) and within-persons (Level-2, person-mean centered) IS on ABP, and allowed the within-person IS slope to vary (i.e., random slope). Results of these models did not support the influence of between-persons association between IS and SBP or DBP, both $p > .79$. Subsequent models removed the between-persons IS variable. Likelihood ratio tests indicated that both IS-Models had significant improvements in model fit over the covariates-model, and these two models did not significantly differ from one another indicating that the between-person IS effect did not contribute significantly (Table 6; 3 vs. 4, 3 vs. 5). In the selected model which excluded the between-person IS variable but retained the within-person IS variable, there was a significant association between within-person IS and SBP such that for each one-unit increase in IS above a given individual's average interpersonal stress there was an associated increase of 0.46 mm Hg in SBP (see Table 6). This relationship was not observed for DBP.

Influence of agonistic motives on interpersonal stress and ABP. To determine whether Agonistic Motives (AS) moderated the relationship between Interpersonal Stress (IS) and ABP, models were built using the IS model with the addition of the Motive Profile variable (i.e., three-group cluster variable) and its interaction with IS. This permitted simultaneous comparisons among the three Motive Profile groups (Agonistic, Transcendence, Dissipated).

Results did not support an interaction between Motive Profile and IS for either SBP or DBP (Table 7). For SBP, the within-person IS association approached but did not attain statistical significance, b=0.71 (SE=1.87), p = .07. The centering approach resulted in this being the estimated slope for the AS group (i.e., reference group for motive profile groups). The positive slope for the AS group was not statistically different than slopes for the DS or TS groups. For DBP, there was a significant group difference such that the DS group had higher DBP (b=87.59, SE=1.28) compared to the AS group (b=83.47, SE=1.14). The TS group was estimated to have higher DBP (b=85.92, SE=1.11) than the AS group; however, this relationship approached but did not attain statistical significance, p =.06.

Influence of perceived social support on ABP. To determine whether Perceived Social Support (PSS) moderated the association between Interpersonal Stress (IS) and ABP, models were built using the IS model described above with the addition of the PSS variable and its interaction with IS. For significant direct or interaction effects of PSS, simple effects and simple slopes were examined by defining three groups as Moderate (Mean), Low (-1 standard deviation), and High (+1 standard deviation).

Results indicate a significant positive association between within-person IS and SBP, but not DBP (see Table 8). For SBP, there was no overall relationship with PSS; however, there was a significant interaction such that for individuals with High PSS the slope of IS on SBP was non-significant whereas for those with Low and Moderate PSS, there was a positive association between IS and SBP. For individuals with Low PSS there was a 0.98 mm Hg increase in SBP for each unit of increase in IS (relative to the individual's within-person average); for Moderate PSS, there was a 0.43 mm Hg increase

(see Figure 2). For DBP, the interaction was non-significant. For DBP, the interaction was not significant. The overall relationship between PSS and DBP was negative; however, this association approached but did not attain significance, $p = .07$.

Influence of agonistic motives and perceived social support on the relationship between interpersonal stress and ABP. A final set of models were fit to determine whether the attenuating effect of Perceived Social Support (PSS) on the association between Interpersonal Stress (IS) and ABP differed by Motive Profile. These models were built using the PSS-IS models described above and added the Motive Profile variable and interactions between this variable, IS, and PSS. Results did not support a three-way interaction for SBP, $F(2, 1948) = 0.16$, $p = .85$, nor DBP, $F(2, 1948) = 1.65$, $p = .19$. Final models were derived by trimming non-significant relationships. For both SBP and DBP, the best-fitting models ended up being previously described models. For SBP, the best fitting model was Model 7:

$$SBP_{ijk} = g_{000} + g_{001}[BMI + Sex + Position + Tobacco + Food] + g_{010}(IS\text{-}WP) + g_{001}(PSS) + g_{010}IS\text{-}WP^{*}\, g_{001}PSS + u_{0i} + u_{0ij} + e_{ijk}$$

For DBP, the best fitting model was Model 6:

$$DBP_{ijk} = g_{000} + g_{001}[BMI + Sex + Age + Position + Tobacco + Food] + g_{010}(IS\text{-}WP) + g_{001}Motive\text{-}Profile + u_{0i} + u_{0ij} + e_{ijk}$$

Ancillary hypotheses. In addition to the primary hypotheses addressed above, two sets of ancillary hypotheses were tested. First, a set of models were fit to evaluate a competing theoretical model by which PSS is stress-buffering by diminishing the impact of Negative Affect (NA) on ABP. Second, models were fit to evaluate another hypothesis

derived from social action theory which postulates that AS fosters recurrent and more intense IS.

Models evaluating the role of NA on ABP were fit using a two-level model given that NA was measured concurrently with ABP. Models included covariates and the person-centered time-varying NA (Level 1) as well as the grand-mean centered NA to reflect between-person differences (Level 2). Models did not support the influence of within-person NA or between-person NA, on either SBP or DBP; all $p > .10$.

Models evaluating the influence of AS on IS were fit using a two-level model with between-persons Motive Profile predicting intercepts and slopes of IS across the measurement period. Results did not support the influence of Motive Profile in predicting between-person nor within-person IS; all $p > .37$.

Discussion

The primary aims of this study were to evaluate the role of between-person differences in agonistic motives and perceived social support in predicting within-person processes of interpersonal stress and cardiovascular activity. Findings offered partial support for the study's main hypotheses while suggesting fruitful new insights into the relationship between perceived social support, stressful interpersonal events, and ambulatory blood pressure levels.

Based on previous research with adolescents and adults, participants' reports of their chronic personal stressors were expected to reveal three distinctive motive profiles: Agonistic, Dissipated, and Transcendence. Levels of ambulatory blood pressure and interpersonal stress were expected to differ across these three motive profile groups, with the agonistic group exhibiting higher blood pressure and interpersonal stress than the

dissipated and transcendence profile groups. These predictions were partly supported. Cluster analyses revealed the presence of the three predicted motive profile groups with T-score profiles that very closely matched the profiles observed previously in four different studies of adolescent and adult samples (Ewart & Jorgensen, 2004; Ewart et al., 2011; Ewart, Elder, Laird, Shelby, & Walker, 2013; Maisto et al., 2014). Further, as in previous studies, the motive profile groups did not differ with respect to sex or race. Agonistic striving, dissipated striving, and transcendence striving were observed to occur with equal frequencies in females and males, and in Blacks and Whites.

Other findings, however, did not support the hypothesized motive profile differences. The three motive profiles were associated with significant differences in hypertension risk as indexed by DBP, but these profile group differences did not exhibit the relationships that have been observed in previous studies. The dissipated group exhibited significantly *greater* risk than the agonistic/transcendence groups. Moreover, the dissipated group was different also in exhibiting significantly greater BMI and waist circumference than the agonistic/transcendence groups which suggests that participants in the dissipated motive group had a risk pattern associated with the early emergence of metabolic syndrome. Thus, the picture is complicated by the possibility that the different motive profiles may be associated with different disease mechanisms.

This does not explain the lack of significant DBP difference between the agonistic and transcendence motive profile groups. It is noteworthy that all three profile groups exhibited nearly identical motive profile structures that have been replicated in four other samples; yet, the blood pressure correlates in this sample are different. One explanation for this might involve the fact that studies of agonistic motives and hypertension risk

have been conducted largely in adolescents; social and biological developmental changes might cause the agonistic motive profile to have less impact on the health of adults. This explanation must be qualified, however, by the observation that recent studies in adults have shown that the agonistic motive profile is associated with higher levels of subjective somatic illness symptoms relative to the transcendence and dissipated profiles (Ewart et al., 2013), as well as by evidence that the agonistic motive profile interacts with emotion regulation capabilities to adversely affect alcohol abuse treatment outcomes (Maisto et al., 2014). Thus, the agonistic motive profile has been shown to have damaging health correlates across a wide range of ages. Not resolved by the recent studies with adults, however, is the question of whether the relationship between the agonistic motive profile and blood pressure may change with development from youth to early adulthood. Although the agonistic motive profile may retain the ability to increase somatic symptoms and undermine compliance with treatment as individuals grow into adulthood, the agonistic motive profile may not continue to affect blood pressure levels in adulthood as it did in adolescence. Other factors, including the emergence of disorders such as metabolic syndrome, may come to play a more influential role. It is possible also that the agonistic motive profile continues to affect cardiovascular health (e.g., by altering stress responses) but that these influences are not indexed directly by the prevailing level of blood pressure. The agonistic motive profile might interact with other mechanisms of disease (e.g. cortisol dysregulation; lowered vagal tone) as cardiovascular illness progresses. Further research should investigate these possibilities.

Motives, Social Support, Interpersonal Stress, and Cardiovascular Activity

A positive association was observed between interpersonal stress and cardiovascular activity in the natural environment and further, this association was attenuated by higher levels of perceived social support. Contrary to study hypotheses, motives did not appear to moderate the relationship between interpersonal stress and cardiovascular activity or to influence the attenuating effect of perceived social support on this relationship. Previous research suggests that individuals with an agonistic motive profile tend to experience higher DBP as compared to individuals with a transcendence or dissipated motive profile. In the present study, individuals with the dissipated motives profile had the highest DBP. Accounting for this departure from previous studies is difficult. Some possible explanations center on the confluence of changes in developmental period (i.e., adulthood versus adolescence), differences in disease pathways associated with aging, and differences in sample characteristics (i.e., obesity).

Differential cardiovascular disease pathways? Previous research examining the impact of motive profiles in predicting cardiovascular outcomes has focused on adolescents (Ewart & Jorgensen, 2004; Ewart et al., 2011); this is the first study to report these relationships in adults. Two recent studies have demonstrated that agonistic motives do predict poor health outcomes in adults including higher levels of subjective somatic symptoms (Ewart et al., 2013) and poorer alcohol use disorder relapse outcomes (Maisto et al., 2014). Although agonistic motives continue to contribute to poorer health outcomes in adulthood, it is possible that the disease pathways begin to diverge. While agonistic motives may not predict prevailing levels of blood pressure, they may affect other disease pathways including lower vagal tone and cortisol dysregulation. Previous

research has demonstrated that agonistic motives combine with blunted vagal tone to predict greater cardiovascular responses to laboratory stress tasks, and this pattern is evident in both adolescents (Parekh, Elder, Schoolman, He, & Ewart, 2012) and adults (Parehk, He, Elder, Schoolman, & Ewart, 2013). For individuals with the dissipated motive profile, the disease process may be indexed by higher risk for metabolic syndrome.

The motive profile groups differed significantly in terms of body mass index (BMI), which may have reduced the ability to clarify group differences in psychosocial processes and cardiovascular response. Although the average BMI for this sample met the criteria for obesity (i.e., 30 kg/m^2) according to the suggested standards of the National Heart, Lung, and Blood Institute (2000), the dissipated striving profile group was significantly more obese than the agonistic motive group. When the dissipated group mean was compared to the mean of the combined agonistic and transcendence groups, they also had a significantly higher average waist circumference. Adiposity has been linked to higher basal cardiovascular activity as well as blunted cardiovascular reactivity (Carroll, Phillips, & Der, 2008; Jones, McMillan, Jones, Kowalik, Steeden, Deanfield, et al., 2012; Piccirillo, Vetta, Fimognari, Ronzoni, Lama, Cacciafesta, et al., 1996; Singh & Shen, 2013). However, in adolescents, central adiposity appears to predict both increased basal cardiovascular activity and higher reactivity to psychological stressors (Goldbacher, Matthews, & Salomon, 2005). Furthermore, there is evidence to suggest that obesity is a distinct pathway to cardiovascular disease (e.g., changes in lipid composition, insulin sensitivity, inflammation), and may also have different psychosocial mediators and mechanisms which confer different risk for developing cardiovascular diseases (Franks,

2006; Lu, Hajifathalian, Ezzati, Woodward, Rimm, & Danaei, 2014; Van Gaal, Mertens, & De Block, 2006). Although this study did not permit analysis of differential disease pathways or developmental patterns as related to motive profile differences in cardiovascular disease, future research using prospective longitudinal designs would help clarify these potential pathways. Advanced changes in vascular functioning (e.g., due to obesity-related disease progression) can impair the ability to detect meaningful changes in cardiovascular responses which may help disclose psychosocial pathways to cardiovascular disease in otherwise healthy adults.

It is worth noting that the agonistic motive group was the only group in which a positive relationship between interpersonal stress and DBP was observed. Although this association approached but did not attain statistical significance, this may suggest that further research using otherwise healthy adults may allow for further differentiation of stress-processes as related to motives. While differences in obesity among the motive groups may have obscured the ability to examine important processes in interpersonal stress and cardiovascular activity, this pattern would suggest a prominent pathway that differentiates the interpersonal stress process for the agonistic group.

Psychosocial impact of the dissipated motive profile. Previous research describes important psychosocial correlates associated with the dissipated motives profile that have implications for a different disease pathway. Ewart and colleagues (2011) provide some initial evidence that the dissipated group differs in health-relevant respects. There is some evidence to suggest that, compared to agonistic and transcendence focused individuals, individuals with the dissipated motive profile are more prone to disengage from goals and their environments, as suggested by lower anger arousal to evocative

situations (describing a time they were intensely angry) and a reduced ability to effectively engage in problem solving to handle their anger. This group also had lower ability to regulate negative affect as indexed by the lowest ability to shift from anger to friendly affect. Independent observers were more likely to rate them as guarded, withdrawn, and unhappy. Social action theory suggests that these individuals have difficulty forming goals which keeps them from effectively engaging with others or to experience positive affect. Further, their guarded and withdrawn interpersonal demeanor may foster social isolation which has been associated with various health risks (Hawkley, Burleson, Berntson, & Cacioppo, 2003; Hawkley & Cacioppo, 2007; Uchino, 2009).

Although individuals with the dissipated motive profile did not differ in terms of overall perceived social support, levels of interpersonal stress, or the proportion of time they spent interacting with others, this study did not assess whether they felt subjectively more lonely, isolated, or depressed. Previous studies have found that generally there is a qualitative difference between the subjective experience of loneliness and objective social isolation, and both contribute independently to cardiovascular disease risk (Hawkley et al., 2003; Peplau & Perlman, 1982). In a previous report which examined the same individuals as the present study, depressive symptoms were associated with higher SBP for the dissipated group, but not the agonistic or transcendence groups (LaFont, Elder, Parekh, Schoolman, Fitzgerald, & Ewart, 2014). Given the dissipated group's impaired ability to generate goals or solutions to stressful encounters, their tendency to have higher levels of obesity, and the possibility that the association between depressive symptoms and chronic elevations of ambulatory blood pressure is heightened in this group, it is

possible that a different disease pathway exists for individuals with the dissipated motive profile.

Social support processes. Although there were no observed motive profile differences in the relationship between perceived social support and the interpersonal stress-cardiovascular activity, it is possible that agonistic motives operate to impair the actual, or "received" social support process (i.e., received social support). There is evidence that the association between social support and cardiovascular activity differs when examining actual versus perceived support (Uchino, 2009; Uchino et al., 2012). However, studies have not yet simultaneously examined associations of received social support and perceived social support in the same study. In a preliminary study of the relationship between perceived social support and negative appraisals of interactions with support providers, one study found that negative social support interactions were associated with increased ambulatory SBP and DBP, and these relationships were significantly attenuated by higher levels of perceived social support (Elder, Parekh, He, Schoolman, LaFont, Fitzgerald, & Ewart, 2014). Although this study did not examine the influence of agonistic motives, and focused on the aggregated levels of ambulatory blood pressure, there is a need to test these hypotheses in future research.

Perceived Social Support, Interpersonal Stress, and Cardiovascular Activity

There was no evidence for a direct association between perceived social support and cardiovascular response. This is somewhat consistent with previous research which has not always supported direct effects of perceived social support. In laboratory studies, this is often attributed to differences in study design (e.g., variation in stressor types) and variation in measurement of perceived social support (e.g., emotional vs. instrumental;

Uchino et al., 2012). Few studies have examined the relationship between social support and cardiovascular disease processes using ambulatory cardiovascular activity; however, these studies have also found mixed support for direct effects (Bowen, Birmingham, Uchino, Carlisle, Smith, & Light, 2013; Brownley, Light, & Anderson, 1996; Holt-Lunstad, Birmingham, & Jones, 2008; Linden et al., 1993; Steptoe, 2000; Vella, Kamarck, & Shiffman, 2008). The majority of previous studies examining the influence of perceived social support on ambulatory cardiovascular activity have used the Interpersonal Support Evaluation List (ISEL; Cohen, Mermelstein, Kamarck, & Hoberman, 1985) to assess perceived social support. The ISEL focuses on delineating the functional aspects of support including tangible, self-esteem, appraisal, and belonging (Cohen et al., 1985). Although few studies have assessed these separate support functions specifically (Bowen et al., 2013), the overall or "global" measure assesses an individual's perception of their ability to receive these *types* of social support. In the present study, a more general assessment of perceived social support was used (Zimet et al., 1988), which focuses more generally on whether an individual believes that support (across types) would be available if needed from a number of different sources (family, friends, other important people).

Some authors argue that measures of global social support are less likely to detect differences in cardiovascular activity, and it is more important to examine specific aspects of social support (Bowen et al., 2013). This approach is important when examining individual differences in preferences for support types, and whether these functions of social support confer the protective attenuation of cardiovascular responding (Uchino, 2009). Instead of focusing on specific functions of support, or examining

potential mediators of the association between social support and cardiovascular activity, the present study focused on the conceptualization of perceived social support as a regulatory mechanism.

Consistent with this conceptualization of perceived social support, the results support a moderation effect such that high levels of perceived social support protect against interpersonal stress induced increases in cardiovascular response. There was a moderate association between interpersonal stress and SBP for individuals with average perceived social support, and the size of association doubled for those with low perceived social support. This finding extends previous research by providing evidence for perceived social support as an important regulatory mechanism which decreases the impact of other psychosocial factors related to cardiovascular disease processes. Importantly, this study employed a more ecologically compelling study design to test these hypotheses outside of the laboratory.

Although it was not possible to test why high levels of perceived social support attenuate the impact of interpersonal stress on ambulatory blood pressure, previous research suggests that implicit knowledge of positive and supportive relationships has far-reaching effects on social functioning. Lakey and Orehek (2011) have described their relational regulation theory to explain the mysterious link between social support and health outcomes. The authors suggest that "mundane" but "affectively consequential" interactions with important support figures throughout the day activate implicit social regulation pathways which may be inherent in the brain, and thereby regulate our responses to the environment.

In the present study, features of these interpersonal relationships – particularly those with an individual's typical support-providers – were not included, and therefore this theory could not be evaluated. But this study provided some initial support that perceived social support does have the expected function of reducing the cardiovascular response to interpersonal stress. While individuals with high perceived support did still experience a range of interpersonal stress, they did not experience the elevation in SBP experienced by those with average or low levels of perceived social support. Future studies are warranted to examine whether important features of social interaction with support providers contribute to this relationship.

It is also important to note that interpersonal stress was more strongly associated with mean arterial pressure than with systolic and diastolic pressure, and had no relationship with heart rate. This pattern suggests increased total peripheral resistance (TPR), which is associated with hyper-vigilance and, if chronic, might lead to the thickening of the vascular walls and higher prevailing levels of blood pressure. Future studies should consider this possibility by assessing TPR, cardiac output, and carotid artery stiffness to determine whether increased TPR due to socially-induced hypervigilance may be a causal pathway by which chronic interpersonal stress leads to cardiovascular disease.

Perceived Social Support, Negative Affect, and Cardiovascular Activity

Tests of ancillary hypotheses did not support the notion that perceived social support attenuated associations between state negative affect and ambulatory cardiovascular activity. The association was not observed at either a between-persons or within-persons level. This suggests that, in the present study, individuals with higher

average levels of negative affect did not have higher levels of ambulatory blood pressure, nor were moments of higher negative affect associated with higher ambulatory blood pressure. Given the lack of association, this precluded tests of whether perceived social support was a moderator of the relationship.

Limitations

This study had important limitations. First, the sample characteristics limit generalizations from this study and also may have affected the study results. As addressed above, there was a high proportion of obese individuals, which limits the generalizability of the findings and may have also affected the ability to detect changes in cardiovascular responses. The sample was also predominantly female, which also limits generalizability and also precluded the ability to make unbiased gender comparisons. This is important because some studies have shown that social support affects cardiovascular outcomes differently in men and women (Bowen et al., 2013).

Second, the design of the ecological momentary assessment may have limited the ability to test other important aspects of the association between interpersonal stress and cardiovascular response. Measuring interpersonal stress concurrently with blood pressure may have permitted more powerful tests of these associations, and further, would have permitted testing of hypotheses related to whether there were carry-over effects of interpersonal stress on future cardiovascular activity. At the same time, even using relatively long 2.5 hour intervals in the present study supported a link between higher cardiovascular activity over intervals where individuals appraised higher levels of interpersonal stress. Another important consideration is the relatively short length of study. Although a 48-hour monitoring period is frequently used to assess ambulatory

blood pressure, longer periods allow for more reliable determination of these associations.

Implications and Future Directions

The present study extends previous research by providing support for the notion of perceived social support as a psychological moderator of the association between interpersonal stress and cardiovascular activity. An important future direction would be to include measures of received social support (Uchino et al., 2012). While perceived social support may index a regulatory capacity that attenuates the association between stress and cardiovascular response, actual interactions in which support is offered may confer different patterns of association. Although there were no observed motive profile differences in the effect of perceived social support, it may be that motives differentiate how well individuals are able to use or respond to actual support. Studies examining responses to received social support suggest that individuals may experience more stress if they are prone to feeling effects of social inequity from receiving support (Shumaker & Brownell, 1984), or if they feel that their sense of independence is threatened (Bolger and Amarel, 2007). Social action theory suggests that individuals with the agonistic motive profile foster chronically stressful interpersonal relationships. Future studies should assess aspects of the actual support relationships to determine whether motives shape an individual's ability to effectively obtain support from others.

This study also suggests that the dissipated motive profile may be associated with a different disease pathway for cardiovascular disease indexed by heightened risk for metabolic syndrome. Given that the relationship between agonistic motives and cardiovascular disease risk has been replicated in multiple samples of adolescents, future

research examining developmental trajectories for these groups would be helpful to determine whether these groups begin to diverge in adulthood. Previous research provides compelling evidence that agonistic striving negatively affects health in adults; however, the disease pathway may be different (e.g., vagal tone, cortisol). Prospective longitudinal designs are an important new direction which would help elucidate the potentially evolving disease pathways in these motive groups.

The results of this study also have important clinical implications. There is evidence that both the dissipated and agonistic motive profiles are associated with poor health outcomes, while those who adopt a transcendence approach consistently appear to have more positive health outcomes. Although future research is needed to develop intervention approaches to help individuals adopt a more transcendence-focused approach, sensitivity to the motivational profile of the patient can yield important information about how an individual approaches their environment in health-relevant ways. It is possible to construe interpersonal problems in less agonistic and more transcendence-focused ways. This could involve learning to view interpersonal challenges as opportunities to develop personal skills, live up to important self-standards, or affirm personal values. The critical factor may be learning to focus on what I can do, as opposed to focusing only on what others must do. This change in focus should enable people to buffer themselves against the stress of agonistic struggles.

Appendix A: Goal-Oriented Strivings Scales

What were the subject's goals in the problem situation? What was he or she trying to accomplish? How did she or he want the situation to be resolved? Consider the "ideal ending" the subject gave in response to the "film director" question. What motives does this ending reveal? Consider other comments during the interview as well, including motives that were implicit or indirectly expressed, as well as motives that were expressed openly (The scales uses a Likert Scale where "1" = "Not at all", and "5" = "Very Much").

Self-Defense

"Wanting someone to stop criticizing him / her?"

"Wanting someone to stop making demands on him / her?"

"Wanting to get even with someone, to get revenge?"

"Wanting someone to stop doing or saying mean things?"

"Striving to protect or defend oneself (e.g. trying to correct an unfair situation, stop hostile criticism / rumors / abuse, get even with someone?"

Acceptance-Affiliation

"Wanting someone to like her / him?"

"Wanting someone to show they understand, to sympathize?"

"Wanting someone to stop ignoring or excluding her / him?"

"Wanting to be closer to someone?"

"Striving for affiliation (e.g., to get someone to appreciate her / his feelings or needs, to achieve intimacy, become closer to someone, obtain sympathetic understanding / support)?"

Approval Seeking

"Wanting to pursue and activity (e.g., course, club, sport) just to please someone else?"

"Wanting to avoid disappointing an important figure?"

"Wanting to accomplish a difficult goal or task just to satisfy a respected person?"

"Wanting to live up to the high expectations of an important person?"

"Striving to attain a difficult standard or goal (e.g., high grade, make team) or engage in activity merely to avoid disappointing a respected person?"

Self-Improvement

"Wanting to achieve a self-standard that's important to him / her personally?"

"Wanting to develop a good habit (lifestyle, diet, exercise, etc.)?"

"Wanting to improve her / his skills in a favorite activity (sport, music, school subject, etc.)?"

"Wanting to improve him / herself as a person (to be nicer, smarter, healthier)?"

"Striving for self-mastery, or for personal achievement (e.g., attain a personally valued goal, master a skill) because the achievement is important personally – not just to satisfy someone else?"

Emotional Expressiveness

"Is poised, at ease, self-assured"

"Speaks emphatically"

"Gives detailed responses"

"Speaks loudly"

"Gives short, monosyllabic responses" (REVERSE)

“Voice (inflection, tone, quality) easily expresses emotion”

“Speech is slow and halting” (REVERSE)

“Speaks rapidly”

“Speaks very softly” (REVERSE)

“Is open, easy to get to know”

Appendix B: The Perceived Social Support Scale

Instructions:

We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement. Circle the 1 if you Very Strongly Disagree, the 2 if you Strongly Disagree, the 3 if you Mildly Disagree, the 4 if you are Neutral, the 5 if you Mildly Agree, the 6 if you Strongly Agree, the 7 if you Very Strongly Agree.

There is a special person who is around when I am in need.

There is a special person with whom I can share joys and sorrows.

My family really tries to help me.

I get the emotional help and support I need from my family.

I have a special person who is a real source of comfort to me.

My friends really try to help me.

I can count on my friends when things go wrong.

I can talk about my problems with my family.

I have friends with whom I can share my joys and sorrows.

There is a special person in my life who cares about my feelings.

My family is willing to help me make decisions.

I can talk about my problems with my friends.

Appendix C: Ecological Momentary Assessment Questionnaires

Activity log collected at each blood pressure measurement:

POSITION (Categorical Variable): Right NOW I am:

1 - Lying down

2 - Sitting down

3 - On my feet and active

ACTIVITY (If not laying or sitting):

1- Mild (standing, moving around)

2 - Moderate (walking, climbing stairs)

3 - Heavy (running, breathless)

Consumption in the past 10 minutes (mark all that apply):

Food: 1/0

Caffeine: 1/0

Smoking: 1/0

All ecological momentary assessments used a seven-point Likert-type scale from 1 to 7.

Interpersonal Stress

"If you interacted with other people during the past 3 hours, how often did you feel..."

Stressed/Irritated

Negative Affect

Right NOW I am:

Angry / Upset

Sad / Discouraged

Appendix D: Multilevel Model Equations

Empty 2-level model:

$ABP_{ij} = g_{00} + u_{0i} + e_{ij}$

Where the subscripts ij refer to variation over i measurements from j participants, g_{00} corresponds to the intercept, u_{0i} corresponds to the error at the highest level (between-persons) and e_{ij} corresponds to the residual error at the lowest level (within-persons).

Empty 3-level model:

$ABP_{ijk} = g_{000} + u_{0i} + u_{0ij} + e_{ijk}$

Where g_{000} now reflects the intercept across 3-levels and the new term u_{0ij} corresponds to error at an intermediate level, in this case level-2 or "Beep" level.

Covariates Model:

$ABP_{ijk} = g_{000} + g_{001}[BMI + Sex] + g_{001}[Position + Tobacco + Food] + u_{0i} + u_{0ij} + e_{ijk}$

$ABP_{ijk} = g_{000} + g_{001}[BMI + Sex + Position + Tobacco + Food] + u_{0i} + u_{0ij} + e_{ijk}$

Interpersonal Stress Model:

$ABP_{ijk} = g_{000} + g_{001}[BMI + Sex + Position + Tobacco + Food] + g_{001}(IS\text{-}BP) + g_{010}(IS\text{-}WP) + u_{0i} + u_{0ij} + e_{ijk}$

Motive Profiles Model:

$ABP_{ijk} = g_{000} + g_{001}[BMI + Sex + Position + Tobacco + Food] + g_{001}(IS\text{-}BP) + g_{010}(IS\text{-}WP) + g_{001}(AS\text{-}TS\ Contrast) + g_{001}(AS\text{-}DS\ Contrast) + g_{011}(AS\text{-}TS\ Contrast)*(IS\text{-}WP) + g_{011}(AS\text{-}DS\ Contrast)*(IS\text{-}WP) + u_{0i} + u_{0ij} + e_{ijk}$

Perceived Social Support Model:

$ABP_{ijk} = g_{000} + g_{001}[BMI + Sex + Position + Tobacco + Food] + g_{001}(IS\text{-}BP) + g_{010}(IS\text{-}WP) + g_{001}(PSS) + g_{011}(PSS)*(IS\text{-}WP) + u_{0i} + u_{0ij} + e_{ijk}$

Motive Profile by PSS Model:

$ABP_{ijk} = g_{000} + g_{001}[BMI + Sex + Position + Tobacco + Food] + g_{001}(IS\text{-}BP) + g_{010}(IS\text{-}WP) + g_{001}(AS\text{-}TS\ Contrast) + g_{001}(AS\text{-}DS\ Contrast) + g_{011}(AS\text{-}TS\ Contrast)*(IS\text{-}WP) + g_{011}(AS\text{-}DS\ Contrast)*(IS\text{-}WP) + g_{001}(PSS) + g_{011}(PSS)*(IS\text{-}WP) + g_{011}(AS\text{-}TS\ Contrast)*(IS\text{-}WP)*(PSS) + g_{011}(AS\text{-}DS\ Contrast)*(IS\text{-}WP)*(PSS) + u_{0i} + u_{0ij} + e_{ijk}$

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Table 1.

Means, standard deviations (SD), and motive profile group differences in study variables.

Variable	Total (n=195) M (SD)	AS (n=68) M (SD)	TS (n=63) M (SD)	DS (n=50) M (SD)
Anthropometric				
BMI	30.38 (7.20)	29.03 (6.96) [A]	30.35 (7.30)	32.18 (7.15) [B]
Waist	37.35 (6.81)	36.68 (6.74)	36.63 (6.61)	38.82 (7.23)
Waist-to-Hip Ratio	0.85 (0.09)	0.84 (0.09)	0.84 (0.08)	0.86 (0.10)
Age	31.95 (3.38)	32.61 (3.28)	31.57 (3.41)	31.42 (3.48)
Time-Varying				
Social Interactions	75.15% (12.14)	76.42% (16.35)	75.00% (19.44)	72.03% (23.05)
Position: Lying Down	12.22% (15.16)	8.82% (14.15) [A]	14.97% (14.96) [B]	14.44% (17.19)
Position: Sitting	60.77% (18.42)	63.10% (17.82) [A]	55.42% (16.25) [B]	62.56% (21.55)
Position: On Feet	27.02% (15.62)	29.08% (13.94)	29.60% (15.68)	23.01% (18.12)
Consumed Tobacco	4.12% (11.57)	4.14% (12.74)	4.63% (10.07)	3.31% (11.86)
Consumed Caffeine	10.20% (14.69)	10.44% (14.05)	9.42% (14.75)	10.53% (15.22)
Consumed Alcohol	2.27% (6.70)	1.80% (5.17)	2.69% (7.92)	3.01% (7.41)
Predictor Variables				
IS	2.81 (1.15)	2.80 (1.18)	2.83 (1.51)	2.91 (1.71)
PSS	49.12 (8.81)	49.92 (7.59)	48.09 (10.34)	49.23 (8.20)
ABP Averages				
SBP	126.00 (12.41)	124.56 (11.86)	126.87 (13.94)	126.45 (9.43)
DBP	82.78 (7.87)	81.36 (7.71) [A]	82.97 (8.11)	85.57 (7.30) [B]
MAP	97.19 (8.31)	95.76 (8.22)	97.61 (9.16)	99.19 (6.61)
HR	82.24 (8.88)	82.25 (8.35)	81.15 (8.89)	83.99 (8.93)

Note: ABP=Ambulatory Blood Pressure (mmHg), MAP=Mean Arterial Pressure, PSS=Perceived Social Support, IS=Interpersonal Stress. Waist circumference measured in inches. Superscript letters indicate significant differences between groups ($p < .05$).

Table 2. Between-persons Intercorrelations.

Variable		2	3	4	5	6	7	8	9	10	11	12
Anthropometric Controls												
1	BMI											
2	Age	.24 **										
Time-Varying												
3	Social Interactions	.02	.01									
4	Consumed Tobacco	-.01	-.06	.11								
5	Consumed Caffeine	-.01	.05	.11	.24 **							
6	Consumed Alcohol	-.09	-.05	-.07	.27 **	-.04						
Primary Predictors												
7	IS	.09	.02	.24 **	.17 *	.08	.13 †					
8	PSS	-.01	.14 *	.20 **	-.16 *	-.12	.05	-.14 *				
Ambulatory Blood Pressure [a]												
9	SBP	.07	.26 **	.04	.03	.09	-.01	.06	-.13 †			
10	DBP	.15 *	.23 **	.07	.01	.04	.03	.07	.09	.51 **		
11	MAP	.20 **	.43 **	.07	.01	.06	.02	.08	.12	.80 **	.93 **	
12	HR	.13 †	-.05	.24 **	.18 *	-.04	.13 †	.13 †	.11	.13 †	.25 **	.23 **

Note: ABP=Ambulatory Blood Pressure (mmHg), MAP=Mean Arterial Pressure, PSS=Perceived Social Support, IS=Interpersonal Stress.

[a] Values of ABP based on individuals within-person average (across all readings).

* $p < .05$, ** $p < .01$, † $p < .10$

Table 3.

Intraclass Correlations at Two and Three Levels.

	Two-Level Models		Three-Level Models	
	SBP	DBP	SBP	DBP
Parameter Estimates				
Intercept	104.14	56.44	95.31	50.92
Beep			26.84	23.74
Residual	104.68	114.3	81.81	96.32
Proportion of Variance by Level				
Level-3			46.73%	29.78%
Level-2	49.87%	33.06%	13.16%	13.88%
Level-1	50.13%	66.94%	40.11%	56.33%

Table 4.

Model Fit Statistics and Likelihood Ratio Tests for Covariate Models.

	Systolic				Diastolic			
Two-Level Models	df	-2LL	AIC	BIC	df	-2LL	AIC	BIC
1 Empty, 2-Level	3	24290.6	24296.6	24306.3	3	24453.8	24459.8	24470.0
2 Time-Varying Covariates	19	24149.0	24173.0	24211.7	19	24086.8	24112.8	24154.7
3 Time-Varying Cov., Reduced	13	24150.6	24168.6	24197.6	13	24088.4	24108.4	24140.6
Three-Level Models								
4 Empty, 3-Level	4	24037.0	24045.0	24057.9	4	24338.5	24346.5	24359.4
5 TV Cov, Reduced	14	23915.3	23937.3	23972.7	14	23974.9	23996.9	24032.3
6 TV Cov, Red + BP Cov.	18	23811.0	23839.0	23884.0	18	23850.1	23878.1	23923.1
7 TV Cov, Reduced (No Random)	11	23983.0	23999.0	24024.8	11	24078.3	24094.3	24120.1
8 TV Cov, Red (No Random) + BP Cov.	15	23878.0	23900.0	23935.3	15	23951.4	23973.4	24008.8
Two-Level Model Comparisons	Δdf	X^2	*p*		Δdf	X^2	*p*	
1 vs. 2	16	141.60	0.00		16	367.00	0.00	
1 vs. 3	10	140.00	0.00		10	365.40	0.00	
2 vs. 3	6	1.60	0.95		6	1.60	0.95	
Three-Level Model Comparisons	Δdf	X^2	*p*		Δdf	X^2	*p*	
1 vs. 4	1	253.60	0.00		1	115.30	0.00	
4 vs. 5	10	121.70	0.00		10	363.60	0.00	
5 vs. 6	4	104.30	0.00		4	124.80	0.00	
5 vs. 7	3	67.70	0.00		3	103.40	0.00	
4 vs. 7	7	54.00	0.00		7	260.20	0.00	
6 vs. 8	3	67.00	0.00		3	101.30	0.00	

Note: TV Cov = Time-Varying Covariates; Red=Reduced; BP Cov=Between-person Covariates.

Table 5.

Effects of time-varying covariates on cardiovascular activity.

	Systolic Blood Pressure			Diastolic Blood Pressure		
Parameter	Estimate	(SE)[a]	*t*	Estimate	(SE)	*t*
Intercept	130.86	2.25	58.47 **	92.40	2.06	44.84 **
Position						
Laying Down	-3.69	0.85	4.33 **	-10.25	0.90	-11.42 **
Sitting	-1.51	0.61	2.49 *	-2.74	0.65	-4.18 **
On-feet	0.00			0.00		
Consumption						
Caffeine	0.34	0.67	0.51	0.68	0.67	1.01
Smoking	2.21	1.59	1.39	3.17	1.43	2.22 *
Alcohol	1.66	1.42	1.17	1.10	1.36	0.81
Food	1.21	0.46	2.67 *	1.82	0.51	3.54 **

[a] Estimates are unstandardized partial regression coefficients.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 6.

Model Fit Statistics and Likelihood Ratio Tests for Explanatory Models.

	Systolic				Diastolic			
	df	-2LL	AIC	BIC	df	-2LL	AIC	BIC
Covariate Models								
1 Empty, 3-Level	4	24037.0	24045.0	24057.9	4	24338.5	24346.5	24359.4
2 TV Cov, Red + BP Cov.	18	23811.0	23839.0	23884.0	18	23850.1	23878.1	23923.1
3 TV Cov, Red (No Random) + BP Cov.	15	23878.0	23900.0	23935.3	15	23951.4	23973.4	24008.8
Interpersonal Stress								
4 Within-Person, Between-Person	19	22415.1	22445.1	22493.2	19	22591.9	22621.9	22670.0
5 Within-Person Only	18	22415.2	22443.2	22488.1	18	22591.9	22619.9	22664.8
Agonistic Striving								
6 Full Model (no BP IS)	22	20927.2	20959.2	21009.3	22	21028.8	21060.8	21111.0
Perceived Social Support								
7 Full Model (no BP IS)	20	22408.5	22438.5	22486.6	20	22588.6	22620.6	22672.0
*PSS*AS*IS Models*								
8 Full Model (no BP IS)	29	20915.9	20957.9	21023.7	29	21022.9	21066.9	21135.9
Model Comparisons								
3 vs 4	4	1462.80	0.00		4	1359.50	0.00	
3 vs 5	3	1462.80	0.00		3	1359.50	0.00	
5 vs 6	4	1488.00	0.00		4	1563.10	0.00	
5 vs 7	2	6.70	0.04		2	3.30	0.19	
5 vs 8	11	1499.30	0.00		11	1569.00	0.00	

Table 7.

Effects of Interpersonal Stress (IS) and Agonistic Motive Profile (AS) on Cardiovascular Activity.

	Systolic Blood Pressure			Diastolic Blood Pressure		
Parameter[b]	Estimate	(SE)[a]	*t*	Estimate	(SE)	*t*
Intercept	131.82	2.27	58.06 **	92.58	1.84	50.33 **
Interpersonal Stress (WP)	0.71	1.87	1.78 †	0.52	0.37	1.42
Motive Profile						
AS vs TS	-0.35	1.86	-0.19	-2.44	1.30	-1.88 †
AS vs DS	-1.35	2.03	-0.66	-4.12	1.43	-2.88 *
DS vs TS	1.00	2.01	0.50	1.68	1.41	1.19
IS Slopes						
AS	0.71	0.38	1.87 †	0.52	0.37	1.54
TS	0.54	0.43	1.25	0.17	0.41	0.50
DS	0.06	0.48	0.12	-0.06	0.47	-0.25

[a] Estimates are nonstandardized partial regression coefficients. Covariate effects of BMI, age, sex, tobacco, food, and position included in model but not reported here. * $p < .05$; ** $p < .01$; *** $p < .001$.

[b] WP = Within-Person centered (mean across all individual's measurements).

Table 8.

Effects ofInterpersonal Stress and Perceived Social Support on Cardiovascular Activity.

	Systolic Blood Pressure			Diastolic Blood Pressure		
Parameter[b]	Estimate	(SE)[a]	*t*	Estimate	(SE)	*t*
Intercept	131.87	1.90	69.32 **	93.84	1.64	57.21 **
Interpersonal Stress (WP)	0.43	0.22	1.96 *	0.31	0.23	1.34
Perceived Social Support	-0.13	0.09	-1.44	-0.11	0.06	-1.80 †
IS (WP) * PSS	-0.06	0.02	-2.55 **	-0.01	0.03	-0.17
Intercepts						
L-PSS	127.89	1.23	104.36 **	85.93	0.98	87.78 **
M-PSS	126.79	1.03	123.43 **	84.92	0.85	99.35 **
H-PSS	125.68	1.34	93.94 **	83.92	1.06	79.00 **
IS Slope						
L-PSS	0.98	0.30	3.28 **	0.35	0.31	1.12
M-PSS	0.43	0.22	1.95 *	0.31	0.23	1.34
H-PSS	-0.11	0.32	-0.34	0.28	0.33	0.83

[a] Estimates are nonstandardized partial regression coefficients. Covariate effects of BMI, age, sex, tobacco, food, and position included in model but not reported here. * $p < .05$; ** $p < .01$; *** $p < .001$.

[b] WP = Within-Person centered (mean across all individual's measurements).

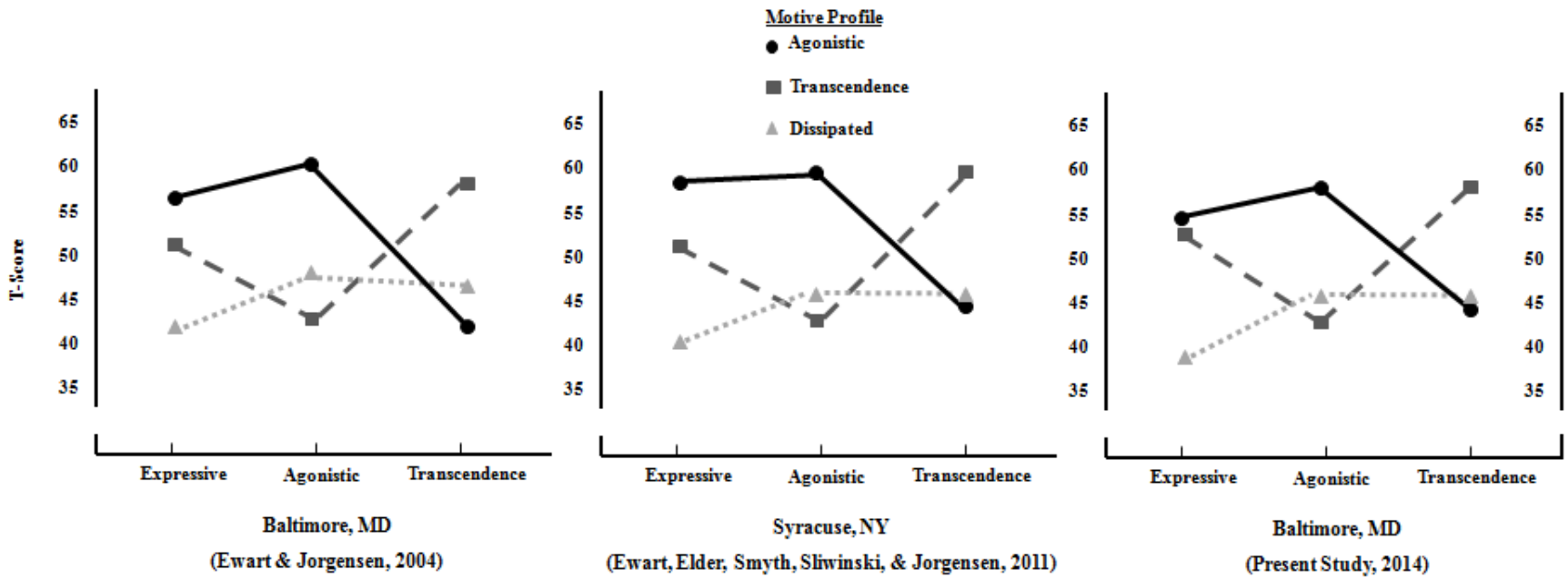

Figure 1. Cluster analysis motive profiles over three samples.

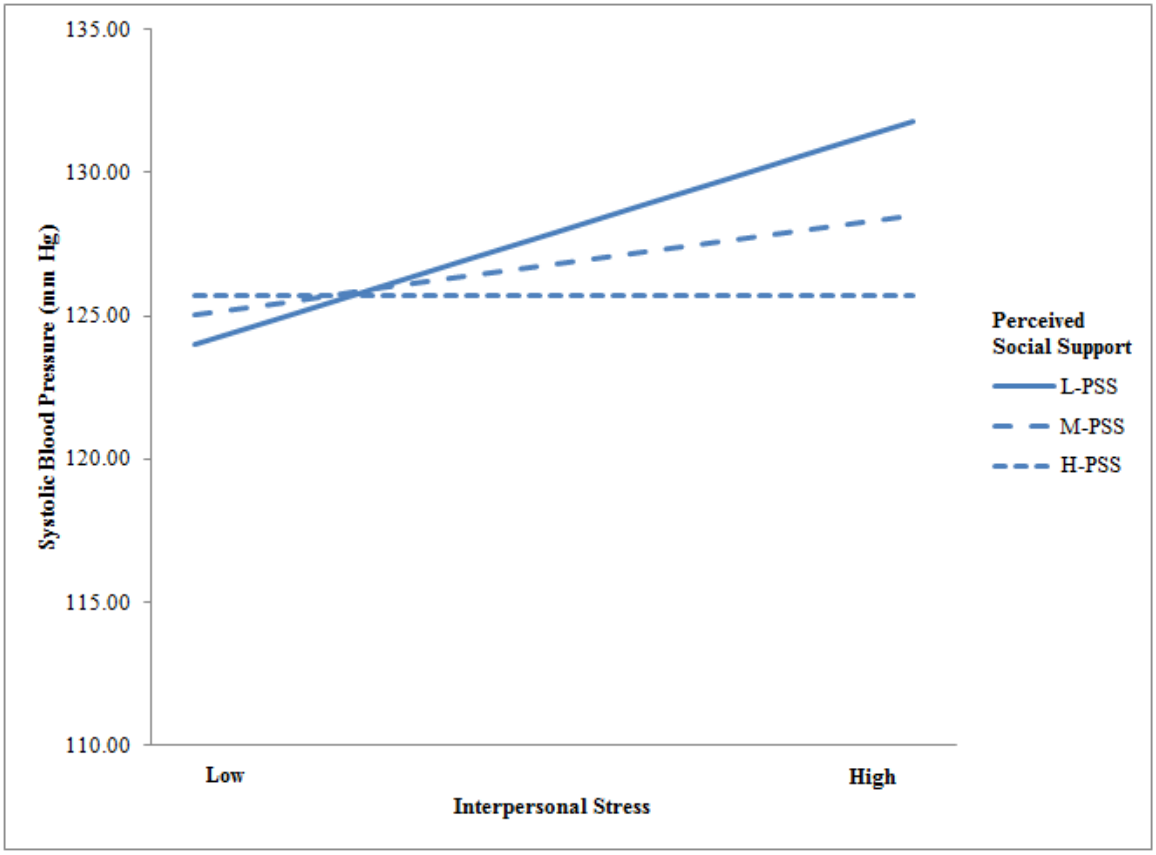

Figure 2. Perceived Social Support Moderates the Association between Interpersonal Stress and Systolic Blood Pressure (controlling for body mass index, sex, age, tobacco and food consumption, and position at time of ambulatory blood pressure reading).

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Syracuse University
Area of Specialization: Clinical Psychology
Master's Thesis: *Goal-Oriented Strivings: Socio-cognitive Mechanisms of Interpersonal Functioning and Cardiovascular Risk Processes* (Advisor: Craig Ewart, Ph.D.)

B.S. (Honours)
2002 – 2007
University of Northern British Columbia (UNBC)
Area of Specialization: Psychology
Honours Thesis: *The Role of Motion in Emotion: Towards a New Methodology in Perception of Emotion* (Advisor: Glenda Prkachin, Ph.D.)

Clinical Experience

Psychology Intern
Sept 2013 – August 2014
Mendota Mental Health Institute, Madison, WI.
APA-Accredited Internship. Inpatient assessment and psychotherapy with adults and adolescents with a variety of mental health and forensic issues. Patients committed following Not Guilty by Reason of Mental Defect or Disease or for competency restoration. Assessment competencies: violence and escape risk, full psychological evaluation, psychodiagnostic clarification, competency evaluation, cognitive evaluation, alcohol and other drug abuse assessments. Psychotherapy including individual and group therapy, time-limited and long-term, using cognitive-behavioral, psychodynamic, interpersonal, humanistic approaches depending referral and presenting complaints. Additional full-year outpatient rotation serving primarily

low-income community clients, performing psychotherapy and psychological testing.

Psychotherapist
August 2012 – May 2013

Addictions Psychiatry, SUNY-Upstate Medical University
Outpatient assessment and psychotherapy with adults with substance use disorders and comorbid conditions. Patients were typically opiate and/or alcohol dependent and had personality disorders. Treatment was abstinence-focused and began with intensive, daily therapy during detoxification, then twice-weekly sessions.

Psychotherapist
March 2009 – May 2013

Psychological Services Center, Syracuse University
Outpatient individual assessment and psychotherapy with older adolescents and adults. Mix of brief and long-term therapy with student and community clients presenting with a variety of psychopathology.

Research Experience

Research Assistant
August 2007 – Present

Craig Ewart, Ph. D, Syracuse University.
Primary role: statistician and data management for NIH-funded research examining psychosocial predictors of cardiovascular disease risk. Statistical competencies: SAS, MPlus, SPSS, Clustan Graphics Cluster Analysis, Excel. Trained confederate and behavioral coder for the Social Competence Interview and Anger Transcendence Challenge.

Research Assistant
May 2012 – Present

Stephen Maisto, Ph. D, Syracuse University.
Primary role: statistician and data management for NIH-funded research focusing on socioemotional predictors of relapse for patients attending outpatient treatment of alcohol-use disorders.

Primary Investigator

Northern John Howard Society. Responsible for the developing and May 2005 - Nov 2006 implementing a program evaluation of career development program for at-risk youth. Project involved design of quantitative and qualitative measures, data collection, and report writing regarding program outcomes and effectiveness.

Research Assistant
May 2004 – May 2007

Ken Prkachin, Ph. D, UNBC. Job responsibilities included being a confederate interviewer in a project examining psychophysiological responses in relation to emotional and stressful situations.

Research Assistant Sept. 2003 – May 2007	**M. Kyle Matsuba, Ph. D, UNBC**. Involvement included a number of studies examining the lifestyles and well-being of at-risk youth. Quantitative measures of psychological well-being; qualitative examination of life-narratives using the McAdams' approach and California Q-Sort methods.

Awards

2009 – 2013	**Social Sciences & Humanities Research Council** Doctoral Fellowship, $80,000 over four years.
2007	**Social Sciences & Humanities Research Council** Canada Graduate Scholarship, $17,500. Declined due to international study.
2006	**Max and Violet Enemark Bursary** Award for a Health and Human Science student who demonstrates high academic proficiency and community/volunteer service, $1, 000.
2004	**Ann McQuaid Memorial Scholarship** Award for academic excellence. The recipient must demonstrate community service, involvement, and leadership, $1, 000.
2003	**UNBC In Course Scholarship** Awarded to students demonstrating academic excellence, $1,200.

Publications and Presentations

Refereed Publications

Ewart, C. K., **Elder**, G. J., Laird, K. T., Shelby, G. D., & Walker, L. S. (2013, July 29). Can agonistic striving lead to unexplained illness? Implicit goals, pain tolerance, and somatic symptoms in adolescents and adults. *Health Psychology*. Advance online publication. doi: 10.1037/a0033496

Ewart, C.K., **Elder**, G.J., & Smyth, J.M., (2012). How neighborhood disorder increases blood pressure in youth: agonistic striving and subordination. *Journal of Behavioral Medicine,* Online first. DOI: 10.1007/s10865-012-9467-4.

Ewart, C.K., **Elder**, G.J., & Smyth, J.M. (2012). How implicit motives and everyday self-regulatory abilities shape cardiovascular risk in youth. *Annals of Behavioral Medicine, 43,* 286-298.

Ewart, C.K., **Elder**, G.J., Smyth, J.M., Sliwinski, M., & Jorgensen, R.S. (2011). Do agonistic motives matter more than anger? Three studies of cardiovascular risk in youth. *Health Psychology, 30,* 510-524.

Matsuba, M. K., **Elder**, G. J., Petrucci, F., & Reimer, K. S. (2010). Restorying the lives of at-risk youth. In K. McLean, & M. Pasupathi (Eds.), *Advancing Responsible Adolescent Development*. New York, NY: Springer.

Matsuba, M.K., **Elder**, G.J., Petrucci, F., & Marleau, T. (2008). Employment training for high risk youth: A program evaluation focusing on changes in psychological well-being. *Child & Youth Care Forum, 37,* 15-26.

Manuscripts in Preparation

Elder, G.J., & Ewart, C.K. (2014). The relevance of hierarchical and intra-individual power processes to the SES-health gradient: A review of the literature on power and cardiovascular outcomes.

Maisto, S., Ewart, C.K., Witkiewitz, K., Connors, G., **Elder**, G.J., Krenek, M., & Ditmar, M.M. (2014). The prediction of time to first alcohol lapse and alcohol consumption by agonistic striving and emotional regulation in men and women in outpatient treatment for alcohol and other drug use disorders.

Ewart, C.K., **Elder**, G.J., Parekh, M., Fitzgerald, S., & He., J.A. (2014). Agonistic and Dissipated Motives combine with biological regulatory mechanisms to produce higher risk categories for cardiovascular disease risk.

Refereed Conference Presentations

Elder, G.J., Parekh, M., He, J.A., Schoolman, J.H., LaFont, S.R., Fitzgerald, S.T. & Ewart, C.K. (2014, Mar.). *Overall Satisfaction with Social Support Buffers the Cardiovascular Stress of Negative Transactions with Support Providers.* Citation Poster, presented at the annual convention of the Society of Behavioral Medicine annual meeting, San Francisco, CA.

LaFont, S.R., **Elder**, G.J., Parekh, M., Schoolman, J.H., Fitzgerald, S.T. & Ewart, C.K. (2014, Mar.). *Dissipated Striving Predicts Increased Hypertension Risk in Persons with Symptoms of Depression*. Poster presented at the annual convention of the Society of Behavioral Medicine annual meeting, San Francisco, CA.

Parekh, M., **Elder**, G.J., He, J.A., Schoolman, J.H., LaFont, S.R., Fitzgerald, S.T. & Ewart, C.K. (2014, Mar.). *Does Transcendence Striving Buffer the Cardiovascular Stress of Social Interactions in Persons with Hypertension?* Poster presented at the annual convention of the Society of Behavioral Medicine annual meeting, San Francisco, CA.

Schoolman, J.H., **Elder**, G.J., Parekh, M., He, J.A., LaFont, S.R., Fitzgerald, S.T. & Ewart, C.K. (2014, Mar.). *Self-Reported Depressive Symptoms Predict Metabolic*

Syndrome in Adults. Poster presented at the annual convention of the Society of Behavioral Medicine annual meeting, San Francisco, CA.

Elder, G.J., Parekh, M., Schoolman, J.H., & Ewart, C. (2013, Mar.). *Implicit Agonistic Strivings Moderate the Longitudinal Relationship Between Diastolic Reactivity in Youth and Adulthood.* Citation Poster, presented at the annual convention of the American Psychosomatic Society annual meeting, Miami, FL.

He, J.A., Velasquez-Garcia, H., Fitzgerald, S.T., Raj, M., **Elder**, G.J., Parekh, M., Schoolman, J.H., & Ewart, C. (2013, Mar.). *Higher Perceived Neighborhood Disorder and Lower Subjective SES Predict Higher Metabolic Syndrome Risk.* Poster presented at the annual convention of the American Psychosomatic Society annual meeting, Miami, FL.

Parekh, M., He, J.A., **Elder**, G.J., Schoolman, J.H., & Ewart, C. (2013, Mar.). *Non-Conscious Agonistic Motives (But Not Emotional Reactivity) Magnify Cardiac Responses to Anger in Persons with Blunted PNS Control.* Citation Poster, presented at the annual convention of the American Psychosomatic Society annual meeting, Miami, FL.

Elder, G.J., Parekh, M., Schoolman, J.H., He, A.J., Fitzgerald, S.T., & Ewart, C., (2012, Apr.). *Do social control motives moderate the impact of ethnic discrimination and denigration on cardiovascular disease risk?* Poster presented at the Society of Behavioral Medicine annual meeting, New Orleans, LA.

He, A.J., **Elder**, G.J., Schoolman, J.H., Parekh, M., Fitzgerald, S.T., & Ewart, C.K., (2012, Apr.). *Adverse cardiovascular effects of exposure to neighborhood disorder and violence are increased by agonistic striving.* Meritorious Poster presented at the Society of Behavioral Medicine annual meeting, New Orleans, LA.

Parekh, M., **Elder**, G.J., Schoolman, J.H., He, A.J., & Ewart, C., (2012, Apr.). *Agonistic striving, blunted parasympathetic control, and heart rate response to anger in low-income youth: Early mechanism of cardiovascular risk?* Citation Poster presented at the Society of Behavioral Medicine annual meeting, New Orleans, LA.

Schoolman, J.H., Parekh, M., **Elder**, G.J., He, A.J., Fitzgerald, S.T., & Ewart, C.K., (2012, Apr.). *Adverse cardiovascular effects of exposure to neighborhood disorder and violence are increased by agonistic striving.* Poster presented at the Society of Behavioral Medicine annual meeting, New Orleans, LA.

Elder, G.J., Parekh, M., Schoolman, J.H., & Ewart, C. (2011, Mar.). *Neighborhood stress and hypertension risk: Does perceived subordination explain the link?* Poster presented at the annual convention of the American Psychosomatic Society annual meeting, San Antonio, TX.

Parekh, M., **Elder**, G.J., Schoolman, J.H., & Ewart, C.K. (2011, Mar.). *Is the impact of agonistic striving on blood pressure magnified by impaired behavioral activation?* Poster presented at the annual convention of the American Psychosomatic Society annual meeting, San Antonio, TX.

Schoolman, J.H., **Elder**, G.J., Parekh, M., & Ewart, C.K. (2011, Mar.). Agonistic striving, everyday self-regulation, and blood pressure: A moderation analysis. Poster presented at the annual convention of the American Psychosomatic Society annual meeting, San Antonio, TX.

Elder, G. J., Parekh, M., Schoolman, J.H., & Ewart, C. K. (2010, Mar.). *Impaired Anger Recovery Amplifies The Impact Of Agonistic Control Motives On Ambulatory Blood Pressure*. Poster presented at the annual convention of the American Psychosomatic Society annual meeting, Portland, OR.

Parekh, M., **Elder**, G.J., Schoolman, J.H., & Ewart, C. K. (2010, Mar.). *Agonistic Striving Impairs Anger Regulation but not Recovery*. Poster presented at the annual convention of the American Psychosomatic Society annual meeting, Portland, OR.

Schoolman, J.H., **Elder**, G. J., Parekh, M., & Ewart, C. K. (2010, Mar.). *Control Motives, Social Competence, and Blood Pressure in Natural Settings: A Multi-Informant Analysis*. Poster presented at the annual convention of the American Psychosomatic Society annual meeting, Portland, OR.

Elder, G.J., Stoekel, N., Hallahan, M., & Ewart, C.K., (2009, June.). *Goal-oriented strivings influence affect regulation and coping goals during a novel emotion regulation manipulation: the Anger Transcendence Task (ATC)*. Poster presented at the Canadian Psychological Association annual meeting, Montreal, QC.

Elder, G.J., Stoekel, N., Kadziolka, M., Hallahan, M., & Ewart, C.K., (2009, Apr.). *SES and blood pressure: Comparing causal pathways in youth*. Poster presented at the Society of Behavioral Medicine annual meeting, Montreal, QC.

Kadziolka, M., **Elder**, G.J., Stoeckel, N., Hallahan, M., & Ewart, C.K. (2009, Mar.). *Agonistic and transcendent goals predict anger arousal and regulation in urban youth*. Poster presented at the Society of Behavioral Medicine annual meeting, Montreal, QC.

Elder, G.J., Stoekel, N., Hallahan, M., Kadziolka., M, & Ewart, C.K., (2009, Mar.). *Neighborhood Stress and Dysfunctional Strivings Increase Illness Symptoms in Urban Youth*. Poster presented at the American Psychosomatic Society annual meeting, Chicago, IL.

Elder, G.J., Stoeckel, N., Kadziolka, M., Ditmar, M.M., Ewart, C.K., & Jorgensen, R.S. (2008, Mar.) *Agonistic and Transcendent Strivings Predict Ambulatory Blood Pressure During Social Interactions in Urban Adolescents*. Citation Poster presented at the American Psychosomatic Society annual meeting, Baltimore, MD.

Stoeckel, N., Kadziolka, M., **Elder**, G.J., Ditmar, M.M., Ewart, C.K., & Jorgensen, R.S. (2008, Mar.) *Urban Disorder and Violence: Possible Origins of Hypertension in Vulnerable Youth?* Citation Poster presented at the American Psychosomatic Society annual meeting, Baltimore, MD.

Kadziolka, M., Stoeckel, N., **Elder**, G.J., Ditmar, M.M., Ewart, C.K., & Jorgensen, R.S. (2008, Mar.) *Urban Disorder and Violence: Possible Origins of Hypertension in Vulnerable Youth?* Poster presented at the American Psychosomatic Society annual meeting, Baltimore, MD.

Elder, G.J., Smith, D., Koehn, C., Prkachin, K.M., & McDonald, P. (2006, Oct.). *Rationalizing smoking cessation interventions in northern British Columbia: Experience of a randomized trial of a triage tool*. Poster presented at the annual convention of the Canadian Rural Health Research Society, Prince George, BC.

Elder, G.J., Allen, B.J., & Matsuba, M.K. (2006, Jun.). *Yo mama's at risk, booyah sucka! An ethnographic evaluation of s career development program serving at-risk youth*. Poster presented at the annual convention of the Canadian Psychological Association, Calgary, AB.

Matsuba, M.K., & **Elder**, G.J. (2006, Mar.). *Changing stories, changing selves: At-risk youth in the remaking*. Poster presented at the meeting of the Society for Research on Adolescence, San Francisco, CA.

Matsuba, M.K., Reimer, K.S., **Elder**, G.J., & Pearson, T. (2005, Jun.). *Morality and the united self*. Paper presented at the symposium entitled "Conceptions of moral selfhood" at the meeting of the John Piaget Society, Vancouver, BC.

Documents of Limited Circulation

Elder, G.J. (2008). Post-traumatic stress disorder (PTSD): A developmental psychopathology approach to understanding issues related to etiology, diagnosis, treatment and prevention. Educational document prepared for Northern Health department of Preventative Public Health, Prince George, BC.

Elder, G.J. (2008). Attention-deficit/hyperactivity disorder (ADHD): A developmental psychopathology approach to understanding issues related to etiology, diagnosis, treatment and prevention. Educational document prepared for Northern Health department of Preventative Public Health, Prince George, BC.

Elder, G. J. (2008). Reactive attachment disorder (RAD): A developmental psychopathology approach to understanding issues related to etiology, diagnosis, treatment and prevention. Educational document prepared for Northern Health department of Preventative Public Health, Prince George, BC.

Elder, G.J., Allen, B.J., & Matsuba, M.K. (2006). *Community Concept Youth Team (CCYT): Northern John Howard Society of BC Youth Employment Project -- Program Evaluation Final Report*. Prince George, BC: Northern John Howard Society of BC.

Allen, B.J., Elder, G.J., & Matsuba, M.K. (2005). *Community Concept Youth Team (CCYT): Northern John Howard Society of BC Youth Employment Project -- Program Evaluation Midterm Report*. Prince George, BC: Northern John Howard Society of BC.

Guest Lecture

"In the Field". (2006, March). A presentation on the experiences, challenges, and benefits of qualitative research in the field. For Dr. Kyle Matsuba's course, Psyc 216: Research Design and Methods II.

Employment Experience

July 2008 - Aug 2008	Preventive Public Health, Northern Health, Prince George, BC. Mental health educator for community outreach workers.
June 2007 - Aug 2007	Preventive Public Health, Northern Health, Prince George, BC. Administrative assistant.
May 2006 - Aug 2007	Future Cents, At-risk youth employment program, Prince George, BC. On-call youth supervisor.
May 2005 - Nov 2006	Northern John Howard Society, Prince George, BC. Program Evaluator, At-Risk Youth Employment Program.

Community Service

2006 – 2007	*Canadian Psychological Association.* UNBC Undergraduate student representative. Role: liaison between undergraduates and the CPA.
2004 – 2007	*PG FolkFest*. Volunteer for artist hospitality at the annual music festival in Prince George.

2003 – 2005	*Board of Directors for CFUR*. Community representative for Prince George's campus-community radio station.
2002 – 2007	*Family YMCA.* Volunteer front-desk assistant.