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Using the Dynamic Model of Affect (DMA) to Examine Leisure Time as a Stress-Coping Resource

Taking into Account Stress Severity and Gender Difference

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Abstract

Affective complexity (AC) is a marker of psychological well-being. According to the Dynamic Model of Affect (DMA), stressful experiences reduce AC, while positive events increase AC. One type of positive events is leisure, which was also identified as a coping resource. This study extended the DMA and leisure coping research by assessing gender difference in how daily stress severity and leisure time influence AC. Analyzing eight-day diary data, we found that females, compared to males, experienced greater decrease in AC with increase in stress severity but also bigger increase in AC with increase in leisure time. The finding highlights gender difference in affective reactivity to and coping with daily stress, the value of the DMA, and the importance of severity appraisal.

Keywords: *The Dynamic Model of Affect (DMA); daily stress severity; leisure time; gender difference; coping*

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Daily stress is a unique form of stress, different from major life events and chronic stressors (Kanner, Coyne, Schaefer, & Lazarus, 1981). According to Almeida (2005), daily stressors are defined as "routine challenges of day-to-day living" (p. 64), e.g., meeting work deadlines, bad commute traffic. Daily stressors also refer to "unexpected small occurrences...that disrupt daily life" (p. 64), such as arguments with a family member, a malfunctioning household appliance. Daily stress is prevalent (Almeida, Wethington, & Kessler, 2002) and has significant effect on affective well-being (Almeida & Kessler, 1998; Serido, Almeida, & Wethington, 2004; Zautra, 2003). Researchers have also reported that the severity of a stressor has significant impact on well-being, sometimes stronger than that of the actual occurrence of the stressor (Carver, Scheier, & Pozo, 1992; David, Green, Martin, & Suls, 1997). Therefore, psychological recovery from severe daily stress is important to sustaining well-being.

One manifestation of psychological recovery is restoring affective complexity to a high level, operationalized as a relatively independent relationship between positive affect (PA) and negative affect (NA) (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Reich, Zautra, & Davis, 2003). Affective complexity, according to the Dynamic Model of Affect (DMA), is high in stress-free situations but becomes dramatically lower in stressful situations, resulting in a highly negative relationship between PA and NA (Zautra, Berkhof, & Nicolson, 2002; Zautra, Potter, & Reich, 1997; Zautra, Reich, Davis, Nicolson, & Potter, 2000). Given the affective dynamics in stress-free and stressful situations, restoring affective complexity can be a goal of effectively coping with severe daily stressors.

The DMA has also been extended to test the effect of positive events (Zautra, Affleck, Davis, Tennen, & Fasman, 2007; Zautra, Affleck, Tennen, Reich, & Davis, 2005). Studying positive events is important, as it "may go far in helping us understand how people are able to persist in stressful situations" (Folkman, 2011, p. 458). Zautra and colleagues found that affective complexity is significantly higher (i.e., low correlation between PA and NA) on days with more positive events than usual (controlling for the effect of stress). Considering that the focus of this line of research is on broadening the scope of the DMA, it is not surprising that the findings were not discussed in light of coping effectiveness. It is also noteworthy that the positive events measured in the studies included a good number of leisure activities (e.g., played a sport with friends, went shopping for pleasure, etc.). It may be possible that leisure contributes to restoring affective complexity on days with severe daily stressors. However, the researchers did not discuss the benefits of positive events from the perspective of leisure, and there has been no direct empirical evidence elsewhere to demonstrate the effect of leisure on affective complexity.

Apart from applying the DMA to studying leisure as a coping resource, another possible extension of the DMA is to assess the effect of gender. Research on stress and coping has identified gender differences in severity appraisal (Almeida & Horn, 2004), affective reactivity to stress (Bolger, DeLongis, Kessler, & Schilling, 1989; Kessler & McLeod, 1984; Pearlin, 1989) and coping style (Ptacek, Smith, & Zanas, 1992). Therefore, testing gender differences in the effects of severe daily stressors and leisure coping on affective complexity may lead to fruitful findings that contribute to our knowledge of affective complexity and leisure coping.

Given the significance of the DMA, the possible contribution of leisure coping to restoring affective complexity and the effect of gender, the purpose of the current study is twofold: (1) to examine whether leisure helps restore affective complexity on days with severe daily stressors; and (2) to assess whether there is gender difference in the effectiveness of leisure as a coping resource.

The Dynamic Model of Affect (DMA)

Affective complexity, a marker of psychological well-being (Ong et al., 2004), is the essential concept that underlies the DMA (Zautra, et al., 2005). The concept refers to the extent to which positive affect (PA) and negative affect (NA) are differentiated and simultaneously represented (Carstensen et al., 2000; Ong, Bergeman, & Bisconti, 2004). High affective complexity is signaled by the relative independence between PA and NA (i.e., very low correlation between PA and NA). Low affective complexity, on the other hand, is manifested by a highly inverse PA-NA relationship (i.e., significantly negative correlation between PA and NA). When developing the DMA, Zautra and colleagues (Zautra et al., 1997) emphasized the effect of contextual factors (e.g., stressful experience) on affective complexity. Individuals process information about the context they are in and their affective reactions to that context (Reich et al., 2003; Zautra et al., 1997). The ability to process information resides on a continuum, with "complex, highly differentiated, and multidimensional" on one end and "simple, unitary, undifferentiated, and unidimensional" on the other end (Reich et al., 2003, p. 70). A stress-free situation allows complex information processing, and individuals are able to process both positive and negative affective reactions to the situation, and then to develop adaptive responses to the situation. In time of low stress, then, affective complexity is high, with PA and NA relatively independent. That is, both PA and NA are present, and a high level of PA does not mean a low level of NA, and vice versa. A stressful situation, however, narrows attention and prompts individuals to concentrate on the immediate demands of the situation, "preferentially process[ing] negative information at the expense of positive" (Zautra et al., 2005, p. 1517). Such process, although enabling quick adaptation to the stressful situation, weakens information processing ability and reduces affective complexity, resulting in a highly negative relationship between PA and NA (i.e., much NA and little PA) (Reich et al., 2003). In short, emphasizing the effect of contextual factors on information processing ability, Zautra and colleagues developed the DMA to demonstrate how affective complexity, operationalized as the relationship between PA and NA, changes in stress-free and stressful situations.

Over the years, Reich, Zautra and colleagues (Zautra, Potter et al., 1997; Zautra, Reich et al., 2000; Zautra, Berkhof et al., 2002; Zautra, Fasman et al., 2005) have tested the DMA with a series of studies of stress and affective outcomes. Although different in sample characteristics, methodologies and time frames of measurement (Reich et al., 2003), these studies have presented consistent findings that provide empirical support for the DMA: individuals experienced relatively independent PA-NA relationship in times of low stress but highly negative PA-NA relationship in stressful situations (see Qian et al. (in press) for a more detailed review of these studies).

More recently, Zautra, Affleck, and Tennen et al. (2005) extended the DMA to studying the effect of positive events (e.g., playing games with friends, social gathering, etc.). The researchers hypothesized that positive events should "relax information demands" (p. 1518) and increase information processing ability, resulting in uncoupling—separating PA and NA that are negatively coupled by stress and restoring their independence (Reich et al., 2003). Findings by Zautra, Affleck, and Tennen et al. supported the hypothesis, as the PA-NA relationship was significantly more negative on days with more negative events than usual (controlling for the number of positive events) but relatively independent on days with more positive events than usual (controlling for the number of negative events). The results demonstrate that positive events can increase affective complexity by helping restore the independence between PA and NA. The findings also echo a suggestion by Reich et al. (2003) that it is important to investigate processes that can

uncouple NA and PA in time of stress in order to facilitate psychological recovery and to sustain affective health. In their study, Zautra, Affleck, and Tennen et al. also examined appraisal of stressfulness, which, according to Aldwin (2011), has impact on the coping process and warrants more research. The researchers found that high perceived stress severity was related to high NA, especially among neurotics. Doing so brought attention to the importance of severity appraisal, although the researchers did not examine whether high stress severity results in reduced affective complexity, nor did they assess whether positive events help restore affective complexity after highly severe stressful events.

In their studies of the DMA, Zautra and colleagues (Zautra, Potter et al., 1997; Zautra, Reich et al., 2000; Zautra, Berkhof et al., 2002; Zautra, Fasman et al., 2005; Zautra, Affleck, Tennen et al., 2005; Zautra, Affleck, Davis et al., 2007) did not examine whether the affective dynamic documented by the DMA differs between males and females. Gender difference deserves attention, because the effect of stress and coping on psychological outcomes can be "conditioned by gender" (Pearlin, 1989, p. 243). For example, Kessler and McLeod (1984) analyzed data from five independent studies and found that females experienced more psychological distress than males, even though the two genders reported similar numbers of negative life events. In a similar vein, Bolger et al. (1989) reported that females experienced NA more frequently than men after encountering the same types of daily stressors (except for financial problems). More recently, however, Almeida and Kessler (1998) showed that females' greater exposure to daily stressors largely accounted for their more frequent experience of daily distress. Taken together, affective experience and reactivity to stress differ between males and females, and examining gender difference may provide a more comprehensive understanding of affective complexity in stressful and stress-free situations, thus strengthening the DMA.

In summary, the DMA provides a framework for studying the effect of stressful and positive events on affective complexity in daily lives. Additionally, the DMA can be used to examine the effectiveness of stress coping resources. That is, one way to examine the effectiveness of a coping resource is to test whether the resource can increase affective complexity by restoring PA-NA independence after stressful experiences. Additionally, examining the effect of severity appraisal and assessing gender difference can augment this examination. The current study focuses on one coping resource—leisure time, and examines whether having leisure time helps individuals cope with severe daily stressors by restoring affective complexity and whether this affective dynamic differs by gender.

Leisure as a Coping Resource and Its Affective Outcomes

Extensive research has provided strong support for the effectiveness of leisure as a resource to cope with stress (Iwasaki, 2010; Kleiber & Hutchinson, 2010), although an identified constraint to leisure participation is stress (Schneider & Stanis, 2007). Some of the studies on leisure as a coping resource have also taken into account appraisal of stress severity. For example, Iwasaki (2001b) found that leisure coping beliefs (relatively stable beliefs that leisure can help people cope with stress) mitigated mental ill-health and increased psychological well-being after undergraduate students experienced severe stressors. Using the same dataset, Iwasaki (2003a) found that students used leisure coping strategies (multiple situation-specific ways in which people use leisure to cope with stress) to facilitate stress reduction and to increase coping effectiveness and satisfaction after experiencing severe stressors. In another study with a sample of employees in the Police and Emergency Response Services Department of a Canadian city, Iwasaki et al. (2002) found that leisure coping beliefs protected physical health against the negative effect

of severe stress. Additionally, leisure coping strategies helped the participants cope with severe stress by sustaining mental health.

The studies by Iwasaki and colleagues, like most early research (e.g., Caltabiano, 1995; Kirkcaldy & Cooper, 1993; Zuzanek, Robinson, & Iwasaki, 1998), mainly assessed health and well-being as coping outcomes (Iwasaki, 2001b, 2003a; Iwasaki et al., 2002). At the same time, Iwasaki (2001a; Iwasaki & Mannell, 2000a) also examined affect, an important marker of psychological well-being (Carstensen, Charles, Isaacowitz, & Kennedy, 2003; Mroczek, 2001), as a coping outcome. In his research with Canadian undergraduate students, Iwasaki assessed four types of emotions as immediate coping outcomes: threat emotions (worried, fearful, and anxious), harm emotions (angry, sad, disappointed, guilty, and disgusted), benefit emotions (exhilarated, pleased, happy, and relieved), and challenge emotions (confident, hopeful, and eager). The results showed that threat and harm emotions declined and benefit emotions increased after students used leisure to cope with severe academic stressors. Leisure also helped students cope with severe interpersonal stressors by increasing challenge emotions. The findings provided evidence that leisure coping reduced negative emotions and increased positive emotions after students experienced different stressors of high severity.

More recently, Iwasaki (2010) focused on stress as a feeling (i.e., stress as negative affective experience, rather than concrete events) and systematically reviewed studies that provided evidence for the effectiveness of leisure in reducing the "feeling of stress" (p. 147). Based on the evidence, the author strongly suggested that integrating leisure of various types into daily life helps promote wellness by reducing the feeling of stress caused by daily hassles, chronic problems and major life events. Indeed, Kleiber and Hutchinson (2010) argued that leisure as a source of "positive distractions" (p. 156) can "substitute positive feelings for negative ruminations or feelings of anxiety and distress" when people are faced with stressful events, thus providing people with the emotional strength needed to persevere. In a similar vein, Moskowitz (2011) summarized that participation in recreational activities is associated with positive but not negative affect. By paying attention to both positive and negative affect, a practice strongly recommended by Folkman (2011), these researchers provided valuable insights into the effect of using leisure to cope with stress on affective outcomes. However, by studying positive and negative affect *separately* as leisure coping outcomes, previous research did not inform us whether leisure helps restore affective complexity in time of severe stress. Therefore, further research is needed to tell a more complete story about affective dynamic as a result of using leisure to cope with severe stressors.

Research on leisure as a coping resource has also paid attention, though limited, to gender difference. Caltabiano (1994) surveyed 340 Australian adults and grouped leisure activities into three types based on their perceived stress-reducing capacities: outdoor-active sport, social, and cultural-hobbies. The author reported that females perceived cultural-hobbies as having greater stress-reducing benefits than males, while males gave outdoor-active sports higher stress-reducing scores than females. Using the same dataset, Caltabiano (1995) found that the effect of life event distress on illness symptoms was significantly smaller when individuals had access to social leisure and cultural-hobbies, but the effect of the two types of leisure activities did not differ significantly between males and females. Later on, Iwasaki, MacTavish, and MacKay (2005) reported that the female participants in their qualitative study regarded leisure time as a personal space for themselves to take a break from busy lives, while the male participants used leisure time as a way to reward themselves. In the psychology field, researchers have found that females, compared to males, use problem-focused coping less frequently (Cramer, 2002; Gross & John, 2003), perceive emotion-focused coping as more effective (Ptacek et al., 1992) and derive more

benefits from emotion-focused coping (Stanton, 2011). Leisure has been identified as a strategy of emotion-focused coping (Iwasaki & Mannell, 2000b; Kleiber, Hutchinson, & Williams, 2002; Trenberth & Dewe, 2002), and it might be possible that using leisure to cope with stress is more effective for women than for men—a possibility that needs empirical testing.

Most research on leisure coping either studied leisure as particular activities (e.g., Caltabiano, 1994, 1995) or examined the underlying psychosocial mechanisms of leisure as a coping resource (e.g., Iwasaki, 2001b, 2003a). Much less attention has been given to the *time* aspect of leisure. The time aspect of leisure deserves attention, because leisure time availability, identified as an important parameter of quality of life (Robinson, 1995), has consequential psychological outcomes. Lack of leisure time has been related to negative psychological outcomes (Beck & Arnold, 2009; Zuzanek, 1998), although having too much leisure time can result in *increased* stress, feeling of boredom and deviant behaviors (Barnett, 2005; Caldwell, Smith, & Weissinger, 1992; Iso-Ahola & Weissinger, 1990; Patry, Blanchard, & Mask, 2007; Rojek, 1997). Past studies have also identified gender difference in leisure time availability, and the findings have been consistent across countries: men have more leisure time on average than women (European Commission, 2004; Mattingly & Bianch, 2003; Nickols & Abdel-Ghany, 1983; Zuzanek & Smale, 1992, 1997), and the psychological benefits of leisure time is weaker for women than for men (Beck & Arnold, 2009; Larson & Richards, 1994).

A small number of studies have accumulated some evidence for the value of examining the time aspect of leisure in coping research. Heintzman and Mannell (2003) reported that the protective effect of perceived leisure time availability on spiritual well-being is stronger among individuals under high time pressure than those with low time pressure. In a study of informal caregivers, Bedini, Gladwell, Dudley, and Clancy (2011) showed that satisfaction with time for leisure, along with satisfaction with leisure experience, contributed to quality of life by reducing perceived stress. Furthermore, Korpela and Kinnunen (2011) found that time spent in nature helped individuals recover from work demands by providing relaxation and enhancing life satisfaction. Taken together, having leisure time can facilitate stress coping. In fact, Kleiber and Hutchinson (2010) suggested that taking time for oneself "can give people a chance to recover and recharge" after stressful experiences (p. 162). At the same time, it is clear that more research is needed to find out whether having leisure time helps restore affective complexity on days with severe daily stressors.

Lastly, it is necessary to point out that restoring affective complexity after stressful experience is different from the buffer effect—one of the well-studied stress coping effects in the leisure literature. According to the buffer effect, the benefit of leisure is the most salient when the stress level is the highest (Iwasaki & Mannell, 2000a). There will be little difference in psychological outcomes between a day with much leisure and another day with little leisure, when stress level is low on both days. However, when stress level is high on both days, the psychological outcomes will be much better on the day with much leisure than on the day with little leisure. Therefore, the buffer effect highlights the value of leisure as a way to *prevent* severely negative outcomes from happening after experiencing stress. The buffer effect is different from the effect indicated by the DMA. According to the DMA, stressful events reduce affective complexity. To successfully react, individuals utilize coping resources to remedy the psychological cost inflicted by stress. In other words, coping resources are the "treatment" that people use to help affective complexity recover *after* experiencing stressful events. Hence, restoring affective complexity after stressful experience is different from buffering the negative effect of stress.

Study Purpose and Research Questions

Given the gaps in literature, the purpose of the current study is to examine the effects of daily stress severity and leisure time as a coping resource on affective complexity, using the DMA as a theoretical framework. We also tested if the effects differ by gender. Specifically, we asked two sets of research questions (RQ). The first set of RQs examined the adverse impact of stress severity: Do individuals demonstrate lower affective complexity, operationalized as a more negative PA-NA relationship, on days with more severe daily stressors than usual (controlling for leisure time)? Does the effect of stress severity differ between males and females? The second set of RQs examined the uncoupling effect of leisure time: do individuals demonstrate higher affective complexity, operationalized as a more independent PA-NA relationship, on days with more leisure time than usual (controlling for daily stress severity)? Is there gender difference in the effect of leisure time? Given documented differences in appraisal of stress severity and affective reactivity to stress by age and socioeconomic status (Almeida, Neupert, Banks, & Serido, 2005; Grzywacz, Almeida, Neupert, & Ettner, 2004; Mroczek & Kolarz, 1998; Sliwinski, Almeida, Smyth, & Stawki, 2009; Stawski, Sliwinski, Almeida, & Smyth, 2008), the effects of age and socioeconomic status were controlled for in all analyses.

Methods

Sample and Procedure

The data for the current study comes from the National Survey of Midlife Development in the United States (MIDUS; Keyes & Ryff, 1998). The original purpose of the MIDUS, conducted in 1995–1996, was to examine successful aging in terms of physical health, psychological well-being, and social responsibility (Serid et al., 2004). In 2005–2006, the second wave of MIDUS was conducted, allowing a follow-up of the original MIDUS sample 9–10 years later. For the current study, we used data from the second wave of MIDUS.

The second wave of MIDUS is composed of five projects. The primary aim of project 1 is to examine a wide array of psychosocial, sociodemographic, and behavioral factors that may influence health and illness. Socioeconomic status was measured in project 1. The primary aim of project 2, the National Study of Daily Experiences (NSDE; Almeida et al., 2002), is to examine the link between various aspects of daily stressors, time use behaviors and health. Severity of daily stressors, leisure time availability, PA, NA, age and gender were measured in project 2. The entire sample of project 2 (NSDE) also participated in project 1. Therefore, we merged the data from projects 1 and 2 to perform analyses for the current study.

MIDUS participants are a national sample of non-institutionalized, English-speaking adult Americans. Participants in the NSDE are a representative subsample of MIDUS participants (N=2022, age 33 to 84, 57.2% female, 92% Caucasians), and received $25 for their participation in the NSDE (Almeida, 2005). NSDE used the daily diary method to collect data, with each participant completing a telephone interview in the evening for eight consecutive days. During each phone interview, participants were asked about their daily stressful experiences, time use behaviors, physical symptoms, PA and NA in the previous 24 hours, yielding a total of 16,176 daily interviews (2022 participants x 8 interview days; for details regarding data collection, see Almeida, McGonagle, & King, 2010). NSDE data collection was spread across an entire year, and consisted of separate "flights" of interviews, with each flight representing the eight-day sequence of interviews. Overall, 92% of the participants completed between 6-8 daily interviews across the 8-day period.

Measures

For the current study, we utilized measures of daily stress severity, daily leisure time availability, daily PA, daily NA, gender, and age from the NSDE dataset. As indicated earlier, the measure of socioeconomic status was merged from project 1 data.

Daily Stress Severity. Daily stressful experiences were assessed through the semi-structured Daily Inventory of Stressful Events (DISE, Almeida et al., 2002). The inventory consists of seven stem questions asking whether the following seven types of stressors occurred within the previous 24 hours: argument, tension (could have had an argument but avoided), work/school stressors (e.g., having a work deadline), home stressors (e.g., one's car breaking down), network stressors (stressors that involve the participant's network of relatives or close friends, e.g., one's child having a sport-related injury), discrimination stressors (based on gender, ethnicity/race, sexual orientation, disability, etc), and any other stressors. For each daily interview, participants who answered affirmatively to any of the seven stem questions about daily stressful events also answered a series of probe questions about the stressful event. One question assesses severity of the stressor: "How stressful was this for you?" Participants indicated how severe the stressor is on a 0-to-3-point scale. The four response options were: not at all, not very, somewhat, and very. For each study day, the sum of the severity ratings was calculated to represent daily stress severity, ranging from 0 to 21.

To study stress coping as a within-person phenomenon, it is necessary to form the daily change scores of stress severity and the other within-person variables for each participant across all study days. In order to do so, we first calculated each participant's average stress severity across the study days using SAS. We then subtracted each participant's mean score from each of his/her daily scores, obtaining a score that represents the participant's daily change in stress severity compared to his/her own 8-day average. In essence, the daily change score is the disparity between daily value and personal mean, representing fluctuation in stress severity around personal mean over days. The daily change score of stress severity is also known as "person-centered" daily stress severity (Zautra et al., 2005, p. 1524).

Leisure time availability. Each day during the phone interview, participants were asked how much time they spent relaxing or doing leisure time activities in the previous 24 hours. If necessary, the interviewer would suggest to the participant that leisure time activities refer to actively choosing to do things for oneself and may overlap with other categories of time use behavior, e.g., spending time with one's children. Participants then provided their own estimates. In the current study, leisure time availability was constructed by calculating the amount of *hours* each day that a participant devoted to leisure activities (e.g., 0.5 means that a participant devoted 0.5 hour to leisure activities on a given day).

To form the daily change score of leisure time availability for each participant across all study days, we first calculated each participant's average amount of leisure time across the study days using SAS. We then subtracted each participant's mean score from each of his/her daily scores, obtaining a score that represents the participant's daily change in leisure time availability compared to his/her own 8-day average. The daily change score of leisure time availability is also known as person-centered leisure time availability.

Affect. Frequency of PA and NA was measured during each daily interview, in keeping with the argument that it is frequency rather than intensity of affect that relates more closely to well-being (Diener & Larsen, 1993; Diener, Sandvik, & Pavot, 1991). Items in the affect scales were culled from the following valid and well-known instruments (Almeida et al., 2002; Mroczek & Kolarz, 1998): the Affect Balance Scale (Bradburn, 1969), the University of Michigan's Compos-

ite International Diagnostic Interview (Kessler et al., 1994), the Manifest Anxiety Scale (Taylor, 1953), the Health Opinion Survey (MacMillan, 1957), the General Well-Being Schedule (Fazio, 1977), and the Center for Epidemiological Studies Depression Scale (Radloff, 1977). Participants indicated how much of the time during the previous 24 hours they experienced each affect item on a 0 to 4 point scale. The five response options were: none of the time, a little of the time, some of the time, most of the time, and all of the time. For each study day, the sum of the items in each affect scale was calculated (Mcrozek & Kolarz, 1998).

The PA scale, with a range of 0-52, has 13 items: "in good spirits," "cheerful," "extremely happy," "calm and peaceful," "satisfied," "full of life," "close to others," "feel like you belong," "enthusiastic," "attentive," "proud," "active," and "confident." To form the daily change score of PA for each participant across all study days, we first calculated each participant's average frequency of PA across the study days using SAS. We then subtracted each participant's mean score from each of his/her daily scores, obtaining a score that represents the participant's daily change in PA compared to his/her own 8-day average. The daily change score of PA is also known as person-centered PA.

The NA scale, with a range of 0-56, was utilized as the outcome measure. The 14 items in the NA scale are: "restless or fidgety," "nervous," "worthless," "sad," "everything is an effort," "hopeless," "afraid," "jittery," "irritable," "upset," "angry," "frustrated," "ashamed," and "lonely."

Demographic variables. Gender was measured as a categorical variable, with male coded as 0 and female coded as 1. Age was measured in years, and was centered at sample mean (56 years old). Educational achievement was used as a proxy of socioeconomic status (Almeida et al., 2005; Grzywacz et al., 2004). It was measured as a categorical variable, with no more than 12 years of education coded as 0 and 13 or more years of education coded as 1. Age (mean-centered) and educational achievement were used as covariates in all analyses.

Data Analysis

The current study utilized multilevel modeling (MLM; Singer & Willet, 2003) to perform data analysis. There are several advantages to using MLM. First, MLM allows for unbalanced numbers of cases per participant (Reis & Gable, 2000), which allows for the inclusion of participants with incomplete data (Raudenbush, Brennan, & Barnett, 1995; Sibthorp, Witter, Wells, & Ellis, 2004). Second, participants do not have to be measured at the same time points, as long as the spacing between two measurements is the same across participants (Willet & Sayer, 1994; Mroczek & Griffin, 2007). Lastly, MLM takes advantage of maximum likelihood estimation, which is more effective than least squares estimation (Reis & Gable, 2000; Sibthorp, et al., 2004). For an overview of MLM, see Singer and Willet (2003). According to Almeida and Wong (2009), the basic form of a multilevel model is as follows:

$$\text{Level 1: } \text{Outcome}_{ij} = \beta_{0j} + \beta_{1j}\text{Predictor}_{ij} + e_{ij}$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + u_{0j}$$
$$\beta_{1i} = \gamma_{10} + u_{1j}$$

At level 1, the outcome is expressed as a function of a within-person intercept, a within-person predictor and a within-person error term. At level 2, the within-person intercept and coefficient are respectively expressed as a function of a fixed intercept and a between-person error term. For a detailed discussion of the principles and advantages of MLM, see Qian et al. (under review).

We first calculated the intraclass correlation (ICC) to make sure that there is sufficient variation in the outcome variable at both within- and between-person levels, which is necessary for further MLM analyses (Hoffman & Stawski, 2009; Raudenbush & Bryk, 2002). We then fitted two multilevel models. The first model answers the first set of RQs: whether affective complexity is reduced on days with more severe daily stressors than usual (controlling for person-centered leisure time), and whether the effect of daily stress severity differs by gender. Following the approach of Zautra et al. (2005), we examined NA on a given day as a function of a within-person intercept, that day's person-centered daily stress severity (DSS), that day's person-centered PA, the DSS × PA interaction, and a within-person error term at level 1 of the model. To control for the effect of leisure time, that day's person-centered leisure time availability was entered as a covariate. At level 2, the level-1 intercept and coefficients were respectively expressed as a function of a between-person intercept, gender and a between-person error term. To control for the effect of age and socioeconomic status, the two variables were entered as covariates.

We fitted the second multilevel model to answer the second set of research questions: whether affective complexity is increased on days with more leisure time than usual (controlling for person-centered daily stress frequency). Again, we followed the approach of Zautra et al. (2005), and examined NA on a given day as a function of a within-person intercept, that day's person-centered leisure time availability (LTA), that day's person-centered PA, the LTA×PA interaction, and a within-person error term at level 1 of the model. To control for the effect of daily stress severity, that day's person-centered daily stress severity was entered as a covariate. At level 2, the level-1 intercept and coefficients were respectively expressed as a function of a between-person intercept, gender and a between-person error term. To control for the effect of age and socioeconomic status, the two variables were entered as covariates.

Results

Descriptive Statistics and Preliminary Analysis

Descriptive information of the variables was presented in Table 1. Average daily stress severity was 2.39 on a 0-21 range, with a moderate variance (1.56), indicating stress severity was much higher on some days than on others. Meanwhile, it is worth noting that there are several possibilities of having a stress severity of 2.39 on a day: (1) by having one stressor that was rated as "somewhat" stressful, and (2) by having two stressors with each rated as "not very" stressful. Therefore, the average daily stress severity does not necessarily mean that the stressor(s) an individual experienced on a certain day had low severity. Average daily leisure time was a little over 3 hours, but the variance was big (2.75), implying that the participants had much more leisure time on some days but much less on others. The average frequency of PA was high (35.53) with a 0-52 range and the average for NA was low (2.72) on a 0-56 range. At the same time, both variables had considerable variances (10.29 for PA and 4.54 for NA), which means that the frequency of PA and PA was much higher on some days but much lower on others.

In terms of correlations, daily stress severity was correlated with leisure time, PA and NA in expected directions. PA and NA were negatively correlated. Increase in age was associated with decrease in stress severity and NA as well as increase in leisure time and PA. Females reported higher stress severity, less leisure time and higher frequency of NA than males. Lastly, those without college education reported higher frequency of PA and lower frequency of NA than the more educated participants.

Table 1

Correlations between Variables and Descriptive Statistics of the Variables

	1.	2.	3.	4.	5.	6.	7.
1. Daily Stress Severity	1.00						
2. Leisure Time Availability	-0.04**	1.00					
3. Daily Positive Affect	-0.28***	0.01	1.00				
4. Daily Negative Affect	0.39***	0.003	-0.49***	1.00			
5. Age	-0.12***	0.09***	0.17***	-0.12***	1.00		
6. Gender	0.15***	-0.07***	-0.008	0.05***	-0.02**	1.00	
7. Education	0.005	-0.003	-0.03**	0.03***	0.02*	0.01	1.00
Mean	2.39	3.09	35.53	2.72	56.24	--	--
Standard Deviation	1.56	2.75	10.29	4.54	12.20	--	--

Notes: N=2,022, based on 16,176 stress days.
*p<0.05; **p<0.005; ***p<0.0001.

Multilevel Models

We first calculated intraclass correlation (ICC), and found that 45.28% of the variation in NA was within-person and 54.72% between-person. The rule of thumb is that there needs to be at least 10% of the variance in the outcome variable as within-person in order to move on to within-person analysis (Mroczek & Griffin, 2007; Raudenbush & Bryk, 2002). The result here indicated that there was sufficient variation in the outcome variable at each level (between- and within-person) to conduct further analyses. We then fit the two multilevel models to answer the two research questions.

We fit the first multilevel model to test the effect of person-centered daily stress severity (DSS) on the PA-NA relationship, controlling the effect of person-centered leisure time (Table 2). While the DSS×PA interaction term was not significant (coefficient = 0.005, p>0.05), gender had a significant effect on the interaction term (coefficient=-0.05, p<0.05). The result means that the change in the PA-NA relationship as a response to fluctuations in daily stress severity differed significantly between males and females. As shown in Figure 1, the slope of the lines represents the PA-NA relationship, with a steeper slope portraying a more negative PA-NA relationship. On days with relatively low stress severity, the relationship between PA and NA was the same among males and females. However, on days with relatively high stress severity, the PA-NA relationship was significantly more negatively among females than among males. In other words, females, compared to males, responded to increase in daily stress severity with a much more significant decrease in affective complexity.

By fitting the second multilevel model, we tested the effect of person-centered leisure time availability (LTA) on the PA-NA relationship, controlling the effect of person-centered daily stress severity (Table 3). While the LTA×PA interaction term was not significant (coefficient = 0.002, p>0.05), gender had a significant effect on the interaction term (coefficient=0.02, p<0.05). The result means that the change in the PA-NA relationship as a response to fluctuations in leisure time availability differed significantly between males and females. As shown in Figure 2, on days with relatively little leisure time, the PA-NA relationship was significantly more negative among females than males. However, on days with more leisure time than usual, the PA-NA relationship became much less negative among females, but even *more* negative among males. In other words, increase in leisure time facilitated an increase in affective complexity among females but resulted in a *decrease* in affective complexity among males.

Table 2

Unstandardized Estimates (and Standard Errors): the Effect of Person-Centered Daily Stress Severity on Affective Complexity and Gender Difference in the Effect (Controlling the Effect of Person-Centered Leisure Time, Age and Socioeconomic Status)

	Daily Negative Affect
Fixed Effects:	
Within-Person Intercept:	
Intercept	3.60 (0.16)**
Gender	0.47 (0.21)
Age	-0.05 (0.01)**
Education	0.04 (0.03)
Person-Centered Daily Stress Severity (DSS):	
Intercept	0.52 (0.07)**
Gender	0.01 (0.09)
Age	-0.004 (0.004)
Education	0.004 (0.008)
Person-Centered Daily Positive Affect (PA):	
Intercept	-0.22 (0.02)**
Gender	-0.05 (0.03)
Age	0.005 (0.001)
Education	0.007 (0.003)*
DSS×PA Interaction:	
Intercept	0.005 (0.02)
Gender	-0.05 (0.02)*
Age	0.001 (0.001)
Education	-0.01 (0.004)*
Person-Centered Leisure Time as a Covariate:	
Intercept	-0.03 (0.02)
Random Effects:	
Variance, Within-person intercept	14.00 (0.61)**
Variance, DSS	0.05 (0.01)**
Variance, PA	0.35 (0.07)**
Variance, DSS×PA	0.003 (0.002)*
Within-person Variance	7.76 (0.22)**

Note: Age was centered at sample mean (56 years old)
*p<0.05, **p<0.0001.

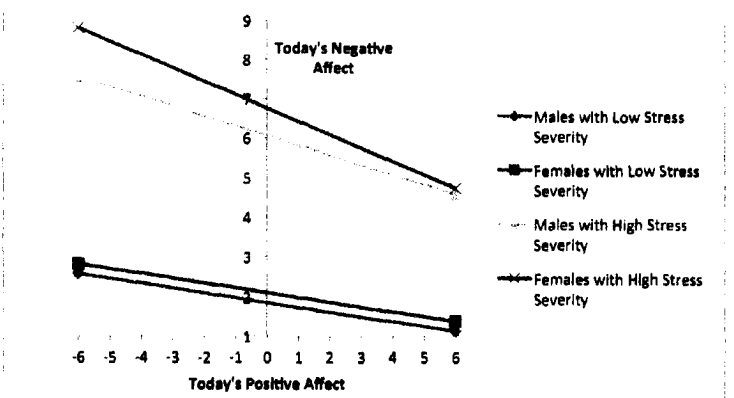

Figure 1. The within-person relationship between positive and negative affect on days with low (-1 sd) and high (+1sd) stress severity among males and females (control for the effect of leisure time).

Table 3

Unstandardized Estimates (and Standard Errors): the Effect of Person-Centered Leisure Time on Affective Complexity and Gender Difference in the Effect (controlling the Effect of Person-Centered Daily Stress Severity, Age and Socioeconomic Status)

	Daily Negative Affect
Fixed Effects:	
Within-Person Intercept:	
Intercept	3.64 (0.16)**
Gender	0.43 (0.21)*
Age	-0.05 (0.01)**
Education	-0.02 (0.03)
Person-Centered Leisure Time Availability (LTA):	
Intercept	-0.04 (0.04)
Gender	-0.03 (0.05)
Age	-0.004 (0.002)*
Education	0.005 (0.008)
Person-Centered Daily Positive Affect (PA):	
Intercept	-0.22 (0.02)**
Gender	-0.05 (0.03)
Age	0.001 (0.001)
Education	0.001 (0.005)
LTA×PA Interaction	
Intercept	0.002 (0.009)
Gender	0.02 (0.01)*
Age	0.0003 (0.0004)
Education	-0.007 (0.002)**
Person-Centered Daily Stress Severity as a Covariate:	
Intercept	0.59 (0.04)**
Random Effects:	
Variance, Within-person intercept	13.71 (0.60)**
Variance, LTA	0.05 (0.01)**
Variance, PA	0.07 (0.02)**
Variance, LTA×PA	0.002 (0.001)*
Within-person Variance	7.90 (0.21)**

Note: Age was centered at sample mean (56 years old)
*p<0.05, **p<0.0001.

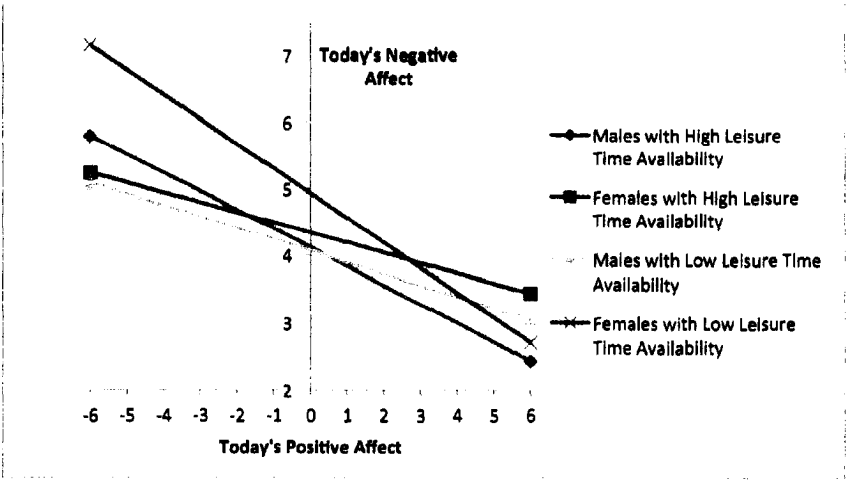

Figure 2. The within-person relationship between positive and negative affect on days with low (-1 sd) and high (+1sd) leisure time availability among males and females (control for the effect of stress severity)

Discussion

The current study used the Dynamic Model of Affect (DMA) (Reich et al., 2003) as a theoretical framework to examine the effects of daily stress severity and leisure time as a coping resource on affective complexity as well as gender difference in the effects. High affective complexity was operationalized as the relative independence between positive affect (PA) and negative affect (NA), and low affective complexity as a highly negative relationship between PA and NA. The effects of age and socioeconomic status (with education level as the proxy) were controlled for in all analyses. We found that, on days with low stress severity, males and females had very similar and comparatively high affective complexity. However, on days with high stress severity, affective complexity was much lower among females than among males. In other words, females, compared to males, responded to increase in stress severity with a bigger decline in affective complexity. Testing the effect of leisure time as a coping resource, we found that affective complexity was significantly lower among females than among males on days with little leisure time. On days with more leisure time than usual, females experienced much greater affective complexity than males. In fact, increase in leisure time, while boosting affective complexity among females, actually reduced males' affective complexity. These findings demonstrate gender differences in the effects of daily stress severity and leisure time as a coping resource on affective complexity, and provide implications for leisure coping and the DMA.

Implications for Leisure as a Coping Resource

Most research on leisure coping studied health and/or well-being as coping outcomes (e.g., Caltabiano, 1995; Iwasaki, 2001b, 2003a; Iwasaki et al., 2002; Kirkcaldy & Cooper, 1993; Zuzanek et al., 1998). Affect, an important marker of psychological well-being (Carstensen et al., 2003; Mroczek, 2001), has received growing, though still much less, attention. For example, Iwasaki and colleagues (Iwasaki, 2001a; Iwasaki & Mannell, 2000a) assessed emotional outcomes of using leisure to cope with severe stressors. The researchers found that leisure coping helped

increase positive emotions and reduce negative emotions after undergraduate students experienced severe stressors of different types. More recent reviews of pervious research point out that leisure can reduce the feeling of stress (Iwasaki, 2010) and generate positive affect that are valuable for people to persevere through stressful events (Kleiber & Hutchinson, 2010; Moskowitz, 2011). These studies brought attention to the importance of examining affect as an immediate stress coping outcome. However, the treatment of positive and negative emotions as two separate outcomes did not tell us much about the effect of leisure coping on affective complexity, operationalized as the relationship between PA and NA. The current study filled this gap and extended past studies in two ways.

First, by using a solid and innovative theoretical framework, we are able to take into account PA and NA simultaneously (rather than separately) and to examine the relationship between the two as a coping outcome. Doing so brings more dynamic into leisure coping research and highlights the value of affective complexity as a coping outcome. Restoring affective complexity is beneficial to psychological recovery and to sustaining affective health after stressful events (Ong et al., 2004). Therefore, affective complexity, manifested by the relative independence between PA and NA, provides a standard for examining the effectiveness of leisure coping.

Second, according to the circumplex model of affect (Russell, 1980), affect differs in not only valence (positive vs. negative) but also arousal (high vs. low activation). While Iwasaki and colleagues assessed both positive and negative emotions as coping outcomes, most emotional items they utilized (e.g., worried, anxious, angry, disgusted, exhilarated, happy, confident, eager) have moderate to high arousal level (Russell, 1980; Feldman, 1995). Few emotional items in their study have low arousal level. Researchers have repeatedly called for going beyond measuring only high-arousal affect to include affect items of both low and high arousal (Moskowitz, 2011; van Eck, Nicolson, & Berkhof, 1998). Our measures of PA and NA answered the call by using affective items with low, moderate and high arousal levels, thus covering a broader affect spectrum than Iwasaki and colleagues did. Doing so not only provides us with more comprehensive measures of PA and NA but also affords our results higher validity.

In the leisure coping literature, there has been limited research on gender difference in leisure coping. Early research by Caltabiano (1994) showed that the perceived coping effectiveness of different types of leisure activities differed between males and females. At the same time, Caltabiano (1995) reported that the stress-buffering effect of social leisure and cultural-hobbies did not differ by gender. A more recent qualitative study by Iwasaki et al. (2005) revealed that females regarded leisure time as an opportunity to take a break from busy lives while leisure time provides males with a way to reward oneself. The current study brings gender back to the spotlight by demonstrating significant difference between males and females in the effect of leisure coping on affective complexity. It is clear that an increase in leisure time above personal average helped females increase affective complexity on days with relatively severe daily stressors. Past studies found that females derived weaker psychological benefits from leisure time than males (Beck & Arnold, 2009; Larson & Richards, 1994), but these studies did not examine the effect of leisure time in the context of severe daily stressors. Given the inconsistent findings from previous and the current studies, it is possible that the benefit of leisure time for females is salient mainly in stressful situations. Perhaps, giving oneself a break on days with relatively severe daily stressors allows females to process and regulate their affect, hence helping restore affective complexity.

In the stress literature, researchers (Kessler & McLeod, 1984; Thoits, 1987) suggested that females do not have adequate personal or social resources for effective stress coping. In our sample, females did have less leisure time than males, echoing findings by past studies of leisure

time availability (European Commission, 2004; Mattingly & Bianch, 2003; Nickols & Abdel-Ghany, 1983; Zuzanek & Smale, 1992, 1997). However, it is possible that females have adapted to the amount of leisure time that they usually have in daily lives and learned to effectively use an increase in leisure time as a personal space away from life's demands (Kleiber & Hutchinson, 2010) and a way to facilitate psychological recovery after experiencing severe daily stressors.

Equally intriguing is the finding that males' affective complexity actually *decreased* on days with more leisure time than usual. Previous research found that having too much leisure time can result in *increased* stress and feeling of boredom (Barnett, 2005; Caldwell et al., 1992; Iso-Ahola & Weissinger, 1990; Patry et al., 2007). Given greater leisure time availability among males in our sample, it is possible that having more leisure time than usual exceeds the amount of leisure time that the male participants need, thus not only failing to help stress coping but also countering coping effectiveness. Unfortunately, the data does not provide information about need for leisure time, making it not feasible to examine whether a (mis)match between need for and actual amount of leisure time matters to stress coping. Another possible explanation for the finding is gender difference in coping styles. Previous research found that males, compared to females, used problem-focused coping more frequently (Cramer, 2002; Gross & John, 2003), perceived emotion-focused coping as less effective (Ptacek et al., 1992), and benefited less from emotion-focused coping (Stanton, 2011). Leisure has been identified as a strategy of emotion-focused coping (Iwasaki & Mannell, 2000b; Kleiber et al., 2002; Trenberth & Dewe, 2002). Hence, the lack of positive effect of leisure time on affective complexity among males may be attributed to males' preference for problem-focused coping and less effective usage of emotion-focused coping.

By examining leisure time as a coping resource, the current study also contributed to the leisure coping literature by manifesting the value of studying the time aspect of leisure. Past studies demonstrated that having leisure time protects spiritual well-being against high time pressure (Heintzman & Mannell, 2003), reduces perceived stress among informal caregivers (Bedini et al., 2011), and helps individuals recover from work stress (Korpela & Kinnunen, 2011). Our study presented further evidence for the benefit of having leisure time in stressful situations and for the importance of studying leisure as time use. Additionally, Kleiber and Hutchinson (2010) suggested that the key to taking time for oneself is to give people "a chance to recover and recharge" from stress experiences (p. 162). Our findings provided empirical support for this suggestion, as females in our sample used the extra time allocated to leisure to regain their affective complexity.

Implications for the DMA

The current study extended the DMA in two ways. First, our findings showed that the effect of severe daily stressors on affective complexity differs between males and females. In other words, there is significant gender difference in the affective dynamics described by the DMA. Males and females demonstrated very similar levels of affective complexity on days with low stress severity. While both genders experienced decrease in affective complexity on days with severe daily stressors, the decrease was much more dramatic among females, supporting the findings of previous research on affective reactivity to stress (Kessler & McLeod, 1984; Bolger et al., 1989; Pearlin, 1989). At the same time, the current study, by focusing on stress severity, complements previous research that used stress frequency (but not severity) as the predictor.

The second extension we made is applying the DMA to coping research. Lazarus (2000) argued that measuring the effectiveness of coping resources is an important agenda in coping research. By harnessing the DMA, we were able to demonstrate that having more leisure time than usual helps females cope with severe daily stressors by restoring affective complexity. The

restoration of affective complexity signals the uncoupling of PA and NA, which is crucial for psychological recovery from stress and for sustaining affective health (Ong et al., 2004; Reich et al., 2003). Therefore, it is clear that the DMA provides a standard for measuring the effectiveness of coping resources and tackles an important aspect of coping effectiveness.

The Importance of Stress Severity

Researchers have reported that the severity of a stressor influences subsequent coping processes (Aldwin, 2011) and has significant impact on well-being, sometimes stronger than that of the actual occurrence of the stressor (Carver et al., 1992; David et al., 1997). In their studies of the DMA, Zautra and colleagues either asked participants to complete a stressful task in a lab setting (Zautra, Reich et al., 2000) or examined the effect of stress *frequency* using daily diary design (Zautra, Potter et al., 1997; Zautra, Berkhof et al., 2002; Zautra, Fasman et al., 2005). Zautra, Affleck, Tennen et al. (2005) assessed the effect of severity appraisal on NA among individuals of different personality traits. However, the researchers did not examine the effect of stress severity on affective complexity per se. The current study, by using daily stress severity as the predictor, makes it clear that severity appraisal influences the affective dynamic described by the DMA and is worth studying.

In leisure coping literature, a series of studies by Iwasaki (2001b, 2003a; Iwasaki et al., 2002) demonstrated the contributions of leisure to undergraduate students' coping with severe stress. Findings from the current study echo those by Iwasaki and colleagues. At the same time, we provided stronger evidence for the value of leisure as a resource to cope with severe stress by conducting within-person analysis using daily diary data collected from a national sample of adult Americans.

Practical Implications

The current study also provides practical implications. Given the finding that leisure time helps females but not males restore affective complexity on days with severe daily stressors, it seems that leisure time as a coping resource is not universally effective. Rather than allocating more time to leisure than usual, males may need to draw on other coping resources in order to restore their affective complexity. For females, however, allocating more time to leisure than usual on a highly stressful day may provide a "time out" (Kleiber & Hutchinson, 2010, p. 162) away from work and life demands, which can be used to cope with the relatively severe daily stressors they encounter.

The findings are also relevant to time management education. According to Kleiber and Hutchinson (2010), experiencing an "emotional uplift" as a result of leisure may "provide the cognitive space for positive reappraisal" (p. 158) and "bolster people's resilience" (p. 161–162). Therefore, females can be suggested not to overlook the contribution of giving oneself a break to successful coping with the demands of daily living. Time management education can also emphasize the importance of setting aside even a little time for leisure, which can go a long way with regulating one's affect and sustaining well-being, especially when faced with severe daily stressors.

Study Limitations and Suggestions for Future Directions

While the current study yields promising findings, it is not without limitations. First, researchers have suggested studying different types of stressors separately (Bolger et al., 1989; Conger, et al., 1993). However, the current study aggregated the severity ratings of all the daily stressors that a participant experienced in a day. Therefore, we did not separately examine the effect of different stressor types, and may have masked differential effects of their severity. Second,

previous research found that having too much leisure time is associated with feelings of boredom (Iso-Ahola & Weissinger, 1990). On the other hand, dissatisfaction with the amount of time for leisure is related to increased stressful feelings (Bedini et al., 2011). Moreover, satisfaction with leisure time experience can influence psychological outcomes of the experience (Kleiber, 1999). However, the only measure of leisure time that the NSDE dataset includes is the amount of leisure time that a participant had in the previous 24 hours. No data was collected on the amount of leisure time a person needs on a daily basis; nor was data collected on individual satisfaction with each day's leisure time experience. Third, collection of data used in our analyses spanned an entire year. However, we did not control for the possible seasonal effect on leisure time availability and affective experiences. Fourth, the eight study days on which each participant provided data include both weekdays and weekends. By using the entire sample, we may have ignored the difference in time use between weekdays and weekends as well as the influence of weekly cycle on affective experience.

In light of the findings and the limitations, we suggest three directions for future research. First, we suggest follow-up studies to examine different types of daily stressors separately. This research will unearth whether the effectiveness of leisure time as a coping resource is the same when used to cope with different types of daily stressors. Doing so will also help us understand whether the effect of leisure time on affective complexity differs between males and females when both genders experience the same type of daily stressors. Second, we urge future studies to measure leisure time in a more comprehensive way, i.e., measuring not only availability of leisure time but also enjoyment of and satisfaction with leisure time. According to Iwasaki (2010), paying attention to "the quality of leisure experiences (e.g., enjoyment, satisfaction)" will provide a better understanding of leisure as a coping resource. Therefore, more comprehensive measures of leisure hold the promise to deepen our knowledge of leisure coping. Lastly, we encourage future research to control for seasonal effect and the effect of weekly cycle on leisure time availability and affective experiences. In this way, researchers will be able to paint a clearer picture of the affective dynamics during the stress coping resource.

Conclusion

This study used the Dynamic Model of Affect (DMA) as a theoretical framework to examine the within-person effect of daily stress severity and leisure time as a coping resource on affective complexity. We also examined whether the within-person process differs between males and females. The findings demonstrated that females, compared to males, experienced a more dramatic decrease in affective complexity on days with relatively severe daily stressors. Meanwhile, on days with more leisure time than usual, affective complexity increased among females but *decreased* among males. Taken together, the study demonstrated the value of the DMA in assessing coping effectiveness and confirmed the significance of severity appraisal to affective well-being. The study also makes it clear that gender plays an active role in the stress and coping process. Although females suffered greater affective damage caused by relatively severe daily stressors, they are also the ones who reaped psychological benefits by allowing oneself more leisure time than usual.

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