Managing a Pet's Chronic Illness:

Factors that Influence Psychosocial Adjustment

BY

MELISSA A. KELLY
B.S., Carnegie Mellon University, 1990
M.Ed., University of West Florida, 2003
Ed.S., University of West Florida, 2006

DOCTORAL DISSERTATION

Submitted as partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Educational Psychology
in the Graduate College of the
University of Illinois at Chicago, 2014

Chicago, Illinois

Defense Committee:

Kimberly Lawless, Chair and Advisor
Margarethe Hoenig, University of Illinois
Kathleen Sheridan
Everett Smith
Yue Yin

To Mandy and Cassie

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AAHA	American Animal Hospital Association
AGFI	Adjusted goodness-of-fit
APGAR	Adaptation, Partnership, Growth, Affection, and Resolve
AVMA	American Veterinary Medical Association
BSI-18	Brief Symptom Inventory 18
CFI	Comparative fit index
CHLC	Chance health locus of control
DHS-R	Daily Hassles Scale–Revised
DIF	Differential item functioning
FAAR	Family Adaptation and Adjustment Response
F-COPES	Family Crisis Oriented Personal Evaluation Scale
GFI	Goodness-of-fit
GSI	Global severity index
IHLC	Internal health locus of control
MHLC	Multidimensional Health Locus of Control
NFI	Normed fit index
NNFI	Bentler and Bonnett's non-normed fit index
PHLC	Powerful-other health locus of control
PTSD	Posttraumatic stress symptoms
RMSEA	Root mean square error
SAM	Stress Appraisal Measure
SCL-90-R	Symptom Checklist 90-Revised
SEM	Structural equation modeling
SES	Socioeconomic status

SUMMARY

The aim of this research was to examine the influence of various intrapersonal, interpersonal, and environmental factors on the psychological adjustment of people who were managing chronic illnesses in their pets. Drawn from research on coping with human illness, the factors included illness parameters, cognitive appraisal, illness locus of control, family functioning, social support, and demographic characteristics. They comprised a theoretical model of variables presumed to influence the caregiver's adjustment in terms of depression and anxiety. Testing the model entailed Rasch analysis and path analysis of questionnaire data utilizing a cross-sectional design. The Rasch analysis provided a means of optimizing the measures in the theoretical model, whereas the modeling component provided a means of testing how well the optimized measures accounted for the adjustment outcomes and refining the model.

The dataset consisted of data collected from 258 caregivers who were managing a variety of illnesses across more than 12 categories. This range included illnesses and disorders that affected neurologic, digestive, cardiovascular, musculoskeletal, renal, respiratory, and endocrine-related functions as well as infectious diseases and blood/immune-related disorders. The vast majority of the caregivers were female, and approximately half were married. By type of pet, dogs were most prevalent, followed by cats.

The initial results revealed that few of the factors exhibited differences among the caregivers in terms of demographic factors such as gender, age, and marital status. There were no significant differences between male and female caregivers in terms of appraisal, family

SUMMARY (continued)

functioning, or depression or anxiety. Similarly, there were no significant differences in appraisal, locus of control, or anxiety between caregivers who were married versus nonmarried. However, married caregivers showed lower levels of depression. Also, the internal locus of male caregivers was significantly lower than the internal locus of female caregivers was.

The results of the path analysis provide mixed support for the hypothesized relationships in the theoretical model of caregiver adjustment. Connections between appraisal and adjustment were somewhat consistent with predictions, but expectancies appeared to play a lesser role in adjustment than originally predicted. For example, caregivers who had a stronger internal locus of control tended to have a stronger challenge appraisal but not a higher threat appraisal. The influence of illness parameters was also mixed. A perceived worsening of the illness did not predict a higher threat appraisal but did predict a lower challenge appraisal. The length of the illness did not influence appraisal or adjustment.

While some of the results confirmed speculations about caregiver adjustment, the results of the Rasch analysis indicated that more work is needed to refine several of the measures used in the model. There is also a need for additional research to further distill how constructs such as illness locus of control and cognitive appraisal may have slightly different meanings in the context of managing a pet's illness than they have in the context of managing human illness. These needs, along with proposed instrument modifications and the implications of the results, are addressed in the report.

I.   INTRODUCTION

Extensive research in the social sciences has documented the strength of the bond between people and companion animals (Cain, 1985, 1991; Carmack, 1985; Gage & Holcomb, 1991; Sharkin & Knox, 2003; Toray, 2004; Turner, 2001; Veevers, 1985). Veterinary research has produced similar findings, highlighting the devotion that people have to their pets and the efforts and expense that they are willing to expend to provide health care for them (American Animal Hospital Association [AAHA], 2004; American Veterinary Medical Association, [AVMA], 2007; Neuvians & Berger, 2002). Advances in veterinary medicine have also made it possible to extend the lifespan of pets suffering from chronic illnesses, potentially increasing the number of people who are managing illnesses among their pets.

In contrast to the wealth of research focusing on how people cope with a pet's death, there is hardly any research that focuses on how people cope with a pet's chronic illness. Emerging health-related quality of life research in veterinary medicine has begun to illuminate some of the issues associated with managing specific illnesses but focuses mainly on facilitating decisions about treatment of the illness (Bowles, Robson, Galloway, & Walker, 2010; Favrot, Zini, Linek, & Mueller, 2010; Lord & Podell, 1999). Assessments of health-related quality of life enable pet owners and veterinary professionals to measure the perceived impact of specific medical treatments and therapies on the pet's physical functioning, cognitive functioning, recreational activities, and overall well-being. Some assessments, such as the questionnaires designed measure the impact of a chronic skin disease known as atopic dermatitis (Favrot et al.,

2010) and epilepsy (Chang, Mellor, & Anderson, 2006; Lord & Podell, 1999), also examine the impact of the illness on the owner's quality of life, especially in terms of lifestyle changes required to manage the pet's illness. Whereas these types of assessments can help pet owners anticipate some of the negative aspects of medical treatment and facilitate treatment compliance, they do not fully address the complex interplay of medical issues and psychosocial ramifications of managing a pet's illness. The present research addresses this need by examining the influence of various intrapersonal, interpersonal, and environmental factors on the psychological adjustment of people who care for companion animals that have various chronic illnesses.

Among the numerous chronic illnesses that afflict both pets and people and have similar etiologies, symptoms, or treatment regimens are diabetes mellitus (Fleeman & Rand, 2001; Neuvians & Berger, 2002; Rock & Babinec, 2008), epilepsy (Chang et al., 2006), atopic dermatitis (Favrot et al., 2010; Marsella & Olivry, 2003), inflammatory bowel disease (Cerquetella et al., 2010), chronic fatigue syndrome (Tarello, 2001), heart disease, chronic bronchitis, cancer, anemia, chronic pulmonary disease, rheumatoid arthritis, and chronic liver disease. Diabetes is a common illness that occurs in cats and dogs (Fleeman & Rand, 2001), and the pervasiveness of the illness is increasing as with diabetes among people (Catchpole, Ristic, Fleeman, & Davison, 2005; Neuvians & Berger, 2002). Similar to human diabetes, canine and feline diabetes are conditions in which the pancreas cannot produce sufficient insulin or cannot adequately process it, resulting in excessive glucose levels in the blood (Fleeman & Rand, 2001; Neuvians & Berger, 2002; Rock & Babinec, 2008; Toma, 1999). Atopic dermatitis is a

relatively common skin condition that occurs in approximately 10% of dogs and also in cats (Marsella & Olivry, 2003). It produces skin lesions and may be concomitant with pulmonary problems. One of the most common adverse effects of the condition is pruritus (severe itching), which may greatly impair the pet's sleep and quality of life (Favrot, et al, 2010).

While the organ systems and treatment procedures vary across these illnesses, a key commonality is that they require the caregiver to perform routine tasks to manage an incurable illness. Many of these tasks, such as attending to medical needs, managing the pet's discomfort, and communicating with veterinary personnel overseeing the pet's treatment are similar to the illness tasks identified by Moos and Schaefer (1984) in their model of adjustment to chronic illness among people. For example, managing diabetes in both pets and people typically involves a treatment regimen such as regular insulin injections and glucose monitoring, as well as dietary changes to control the course of the illness. Moreover, the stakes of managing the illness can be extremely high, as the effects of both canine and human diabetes can be fatal if not managed properly. Managing atopic dermatitis typically involves drug treatment, allergen avoidance, and immunotherapy (Marsella & Olivry, 2003). Managing epilepsy, which is one of the most common brain diseases that occurs in dogs (Chang et al., 2006), also requires adherence to treatment protocols and a significant time commitment (Lord & Podell, 1999; Podell, 2009). The caregiver often has to administer medication on a regular schedule, closely monitor the pet for signs of adverse reactions to the medication, and quickly transport the pet to emergency

treatment facilities as needed. If the condition is not treated properly, the pet may suffer brain

damage or loss of life.

Another commonality among these illnesses is their potential to create additional sources

of stress among people who are managing them. Research on managing chronic illnesses in

people has shown that the conditions can be highly stressful for not only the person who has the

illness but also his or her family members (Kazak, 1992; Moos & Schaeffer, 1984; Patterson,

1988; Thompson & Gustafson, 1996). Research on the psychosocial impact of diabetes and

other chronic illnesses has shown that parents of children who are ill as well as adults who have

these illnesses can have substantial adjustment problems, higher levels of psychological distress,

and poorer health and well-being (Berge, Patterson, & Reuter, 2006; Hocking & Lochman, 2005;

Seiffge-Krenke, 2001; Stanton, Collins, & Sworowksi, 2001; Thompson & Gustafson, 1996;

Thompson, Gustafson et al., 1992a; Wallander & Varni, 1992). Parents especially can face

increased worries about the child's condition and the challenges of arranging family schedules to

accommodate the demands of the illness (Seiffge-Krenke, 2001). For the mother, who is

typically the primary caregiver (Coffey, 2006; Thompson & Gustafson, 1996), these concerns

are often exacerbated as she shoulders most of the burden for the child's care until the child

reaches a developmental age at which he or she can assume primary responsibility. Marital

discord is also common among families with a chronically ill family member as the primary

caregiver devotes much more of his or her time to tending to the needs of child relative to

tending to the emotional needs of the spouse (Berge et al., 2006).

A similar trend in maternal caregiving exists in the pet context. According to the AVMA (2007, p. 1), "overwhelmingly, women across the age spectrum typically were the primary caregivers of pets. The [national] study found that 74.5% of pet owners with primary responsibility for their pets were female in 2006." Given similarities in the demands of chronic illnesses and the potential disruption to the family's lifestyle, it is likely that caregivers for chronically ill pets, especially mothers, would confront comparable issues. Anecdotal evidence supports this claim, but systematic research is needed to examine how these issues manifest themselves in the pet context and affect the well-being of both the caregiver and pet.

A.   **Purpose of the Study**

The present study presents a framework for empirically examining how various illness-related, intrapersonal, and interpersonal factors affect people's adjustment to caring for pets with chronic illnesses. Drawn from existing models of adjustment to chronic illness among people, including the transactional model (Thompson & Gustafson, 1996; Thompson, Gustafson et al., 1992a, 1992b) and the family adaptation and adjustment response (FAAR) model (Patterson, 1988, 1989), the proposed model of adjustment examines how forces within and around the family system influence the caregiver's adjustment. Included in these factors are attributes of the illness, personal demographics, socioenvironmental factors, cognitive processes, and coping strategies. Both the transactional model and FAAR provide insight into how sources of stress, as well as the family context, can mediate the caregiver's appraisal of the illness and his or her ability to draw from a variety of resources to manage it. The FAAR model also provides a

framework for understanding how societal norms related to the social position of pets contribute to the caregiver's stress and coping processes, which further affect his or her adjustment. Use of these models in the present study is grounded in an ecological perspective that recognizes that chronic illness affects the entire family system and that the family and other social systems influence the impact of the illness on the primary caregiver.

Bronfenbrenner's (1977, 1979) theory of social ecology, which has been widely used to examine human development, provides a tiered framework for representing pets at the innermost level of family systems. Although Bronfenbrenner's theory does not explicitly include pets, extensive research in the social sciences documenting the status of pets as integral members of many family systems grounds this view (Cain, 1985; Carmack, 1985; Sharkin & Knox, 2003; Toray, 2004; Turner, 2001; Veevers, 1985). Market research has shown a similar trend among the estimated 68.7 million U.S. households that have at least one pet (AVMA, 2007). In survey data collected from 47,842 U.S. households in 2006, the AVMA found that 49.7% of the respondents who had at least one pet "considered their pets to be family members and nearly half, or 48.2%, considered their pets to be pets/companions" (p. 1).

These trends suggest that research on adjustment to illness among pets should incorporate family dynamics and the role that the pet plays in the family in addition to examining the medical attributes of the illness. Literature on grieving for the loss of a pet also underscores the need to understand how disparities between the role that the caregiver ascribes to the pet and the role ascribed by a spouse or other family members can shape the caregiver's adjustment process

and well-being (Cain, 1991, Carmack, 1985; Margolies, 1999; Toray, 2004). The purpose of the present research was to examine how these factors interact with caregiver characteristics and generic attributes of various chronic illnesses to influence caregiver adjustment.

B.   Research Questions and Definitions

In examining adjustment among people managing chronic illness in their pets, the study addressed the following research questions:

1. How do personal, social-environmental, and cognitive factors in the proposed model relate to caregiver demographics such as gender, education, marital status, and age?

2. To what extent do personal, social-environmental, and cognitive factors in the proposed model contribute to psychosocial adjustment outcomes among caregivers of pets with chronic illnesses?

3. How well does the proposed theoretical model of caregiver adjustment to managing chronic illness account for the variance and covariance in adjustment outcomes?

For the purpose of this research, a caregiver is defined as a person who voluntarily attends to the health and well-being of a pet that has or has been diagnosed with a chronic illness or disease. Use of the term *caregiver* rather than *owner* is meant to reinforce the idea that the person is providing more than medical care for the pet; he or she is also attending to the emotional well-being of the dog or cat. Use of the term *voluntarily* is meant to exclude veterinary professionals who provide care as a condition of paid or otherwise compensated employment.

There are varied definitions of chronic illness among people, but most share the characteristics of producing impaired physical or cognitive functioning, having a prolonged course of a month of longer, requiring routine or continual hospitalization or home medical care, and being manageable but not having a known cure (Leventhal, Halm, Horowitz, Leventhal, & Ozakinci, 2004; Pless & Pinkerton, 1975; Thompson & Gustafson, 1996; Wallander & Thompson, 1995). In the veterinary field, chronic illness has been defined more ambiguously as a condition "persisting over a long period" (Cochran, 1991, p. 186) with the length of the period varying from weeks to months or years (Blood, Studdert, & Gay, 2007; Kahn, 2007; Toma et. al., 1999). For the purposes of this research, a chronic illness is defined as a medical condition that (a) has lasted or is expected to last for 3 or more continuous months, (b) requires a specialized medical treatment regimen administered in the home or in a veterinary facility, and (c) impacts the pet's physical functioning or quality of life especially if the condition is not treated. Etiology of the illness is not a factor for the purpose of this research.

C.   **Significance of the Study**

As the prevalence of chronic illnesses such as diabetes increases (Catchpole et al., 2005; Neuvians & Berger, 2002) and the lengths to which caregivers go to extend the quality and quantity of their pet's lives also grow (AAHA, 2004), research on managing chronic illness is especially important for helping veterinary professionals assist their human patients in caring for their pets. Given the parallels between managing chronic illnesses among people and pets (Rock & Babinec, 2008) and the status of pets as family members (Margolies, 1999; Sharkin & Knox,

2003; Turner, 2001), it is likely that caregivers of pets with chronic illnesses would face similar issues as families that are managing human illnesses. Understanding how these issues manifest themselves in a pet context can help veterinary professionals to better address the emotional and psychological needs of their clients much in the way that understanding pet loss has helped veterinary professionals cater to the needs of clients who are contending with end-of-life issues. This research can help inform veterinary professionals of the sources of illness-related stress and suggest ways of alleviating these stresses, thereby promoting the health and well-being of both the pet and the caregiver.

Just as research on pet loss has helped professionals in psychology-related fields better understand how to help clients who are in mourning the loss of a pet (Carmack, 1985, Cowles, 1985; Sharkin & Knox, 2003; Turner, 2001), research on pet illness can also help practitioners understand how to assist people who are managing illness-related stresses. This research can also inform the development of interventions in family therapy to help caregivers who are struggling to balance the demands of the illness with other family responsibilities. For other individuals who interact with people who consider their pets to be their children or close companions, this research illuminates how their interactions may help or hinder the overall coping process. From a measurement perspective, the study also implies considerations for investigating illness-related constructs in a veterinary context.

II.   CONCEPTUAL FRAMEWORK

One of the most common roles that pets have in a family is as surrogate mates, children, or other relatives (Sharkin & Knox, 2003; Toray, 2004; Turner, 2001; Veevers, 1985). When the pet functions as a surrogate mate or significant other, the relationship is typically similar to a spousal bond or the bond between very close friends. As a surrogate family member, the pet typically serves as a surrogate child (Turner, 2001; Veevers, 1985) or as another relative who has previously passed away (Margolies, 1999; Sharkin & Knox, 2003). Historically society has viewed pets as substitute children in couples who either choose not to have or cannot have children (Veevers, 1985). However, market research has shown that pets are just as likely to live in families with children as they are in families without children, with 48.5% of all pet-owning households (AVMA, 2007) being parents rather than singles or couples. While research has shown that females are typically the primary caregivers in both the context of caring for a child with a chronic illness (Thompson & Gustafson, 1996) and caring for a pet (AVMA, 2007), these individuals typically function within a family system. Their adjustment to the illness is dependent not only upon individual or illness-related factors but also upon interactions with the environment and other members of the family system (Kazak, 1992; Moos & Schaefer, 1984; Thompson & Gustafson, 1996). Moreover, because the family system operates within a larger societal system, there are also external forces that influence the caregiver's adjustment. Examining relationships among these forces calls for an ecological perspective (Kazak, 1992; Patterson, 1988; Thompson & Gustafson, 1996).

A.   Ecological Systems Theory

Bronfenbrenner's (1977, 1979) theory of social ecology has played a key role in identifying inter- and extra-individual forces and modeling their role in shaping adjustment to chronic illness among people (Kazak, 1992; Patterson, 1988; Thompson & Gustafson, 1996). The theory also provides a foundation for the proposed model of caregiver adjustment. The main premise of Bronfenbrenner's (1977, 1979) theory is that an individual's development is a product of bidirectional interactions within and across a set of nested levels with the individual at the core. The innermost level, labeled the *microsystem*, represents the settings and roles in which a person routinely and directly operates. An example of a familial setting is a person's home in which he or she may function in a variety of familial roles such as parent, spouse, son, daughter, or sibling. Other examples of microsystems include work and school settings in which the person routinely operates. The second level, known as the *mesosystem*, encompasses a set of microsystems. For example, a parent not only interacts with members of his or her home microsystem but may also interact with coworkers in a microsystem based on his or her job. In the context of chronic illness, the mesosystem also includes hospitals and other care settings in which the person with the illness and his or her caregiver routinely interact. The third level in Bronfenbrenner's (1977, 1979) framework is the exosystem. Unlike the mesosystem in which the person is a direct participant in the system, the exosystem represents settings that have an indirect influence on the person. From the perspective of a caregiver, an exosystem might include social networks of other members of the family with which the caregiver does not have a

particular role or the caregiver's community. The level farthest removed relative to the central person is the macrosystem. This level represents the cultural norms and political structures in the society in which the person functions.

The microsystem and mesosystem have typically been focal in existing models of adjustment to chronic illness among children and adults (Kazak, 1992). Some models have framed adjustment exclusively within the microsystem. For example, the transactional model of stress and coping (Thompson, Gil et al., 1993b; Thompson, Gil et al., 1994; Thompson & Gustafson, 1996; Thompson, Gustafson et al., 1992a, 1992b), which has been widely used to examine both pediatric and maternal adjustment to a child's chronic illness, depicts a child's adjustment as partly influenced by the adjustment of his or her mother; in turn, the child's adjustment influences the mother's adjustment. Other models such as the FAAR model extend beyond the microsystem of the person with the illness and examine the influences of the community and larger society in terms of the demands they place upon the inner systems as well as the coping resources they afford (Patterson, 1988). Hence, these models differ in terms of the levels of ecological systems that they incorporate as well as the main unit of analysis, but they share a premise that interactions among the person with the chronic illness, his or her family, and their environments influence adjustment among the members of the system.

B. **Models of Adjustment to Chronic Illness**

Among the models of adjustment to chronic illness that examine the role of ecological subsystems in shaping adjustment outcomes are the transactional model of stress and coping

(Thompson, Gil et al., 1992; Thompson & Gustafson, 1996; Thompson, Gustafson et al., 1992a; Thompson, Gustafson et al., 1988) and the FAAR model (Patterson, 1988, 1989). Another commonality among these models is the integration of the work done by Lazarus and Folkman (1984) in identifying cognitive appraisal and selection of coping strategies as central elements of the overall coping process (Leventhal et al., 2004). Influencing these processes and shaping adjustment across the models are a range of intra- and interpersonal factors. There is wide variation among models, though, in terms of specifically how these elements function, how adjustment is conceptualized, and what the factors are that influence adjustment processes and outcomes (Stanton et al., 2001). For example, the transactional model of stress and coping focuses on how the mother and child cognitively appraise the context of the illness and how these appraisals influence the mother and child's adjustment (Thompson, Gil et al., 1992; Thompson & Gustafson, 1996; Thompson et al., 1998; Thompson, Gustafson et al., 1992a). The FAAR model, which describes how families adjust as a unit to the chronic illness of one of its members, conceptualizes adjustment in terms of how the family balances the demands placed upon them by the illness with their capabilities for managing these demands (Patterson, 1988, 1989).

Another dimension along which models of adjustment differ is whether they are categorical or noncategorical. Categorical models focus on how people adapt to specific illnesses (Berge et al., 2006; Hocking & Lochman, 2005; Kazak, 1992; Stein & Jessop, 1982; Thompson & Gustafson, 1996; Wallander & Thompson, 1995; Wallander & Varni, 1992). The

main assumption underlying these approaches is that various illnesses differ distinctly in terms of etiology, physiological manifestations, physical or cognitive impact, and treatment regimen and that focused study on these differences is the optimal method of understanding how an illness influences particular patterns of adjustment (Kazak, 1992; Wallander & Thompson, 1995). Proponents of categorical approaches have also argued that they enable the development of targeted interventions to foster bon-adaptive adjustment.

In contrast to categorical models, noncategorical models of adjustment are applicable across a wide array of illnesses (Berge et al., 2006; Hocking & Lochman, 2005; Kazak, 1992; Rolland, 1987; Stein & Jessop, 1982; Thompson & Gustafson, 1996; Wallander & Thompson, 1995; Wallander & Varni, 1992). Examples of these types of models include Moos and Schaefer's (1984) framework of adaptive tasks and applications of the FAAR model. The main assumption of noncategorical models is that there are commonalities across various types of chronic illnesses that influence adjustment in similar ways or have similar outcomes. Although categorical models dominated early research on adjustment, researchers presently advocate a balanced approach that facilitates knowledge building and generalization across illnesses (Hocking & Lochman, 2005; Rolland, 1984; Stein & Jessop, 1982). An example of this type of hybrid model is the transactional model of stress and coping (Thompson et al., 1998) in which the illness-related parameters that directly influence how the mother and child cope with the illness include a mix of generic illness factors and illness-specific factors such as types of illness.

1.   **Transactional model of adjustment**

The transactional model of stress and coping provides a model for examining the interplay between the illness, the individual, and the family by focusing on the mother-child dyad and how transactions between illness parameters, demographic parameters, and adaptation processes influence adjustment within this ecological system (Thompson, 1985; Thompson & Gustafson, 1996; Thompson et al., 1998; Wallander & Thompson, 1995). Framed by Bronfenbrenner's (1979) theory of ecology, the model positions the mother's adjustment as a factor that directly influences the child's adjustment and vice versa. Other direct influences on the mother's adjustment are three sets of adaptation processes: cognitive processes, coping methods, and family functioning. These processes mediate the effects of the illness parameters and demographic parameters on both the mother and child's adjustment. In some variants of the model, the child's cognitive processes and coping methods also have direct influences on the child's adjustment (Thompson et al., 1998).

a.   **Components of the model**

i.   **Illness parameters**

The main illness parameter in the transactional model is illness severity, which researchers have commonly operationalized in illness-specific terms (Thompson, Gil et al., 1992; Thompson, Gil et al., 1993a, 1993b; Thompson et al., 1998). For example, in studies of adjustment to cystic fibrosis, researchers have typically assessed severity using the Shwachman Clinical Evaluation System, which assesses a patient's functioning in several areas including

lung functioning (Thompson et al., 1998; Thompson, Gil et al., 1994; Thompson, Gustafson et al., 1992a, 1992b). Cystic fibrosis results in excessive mucus buildup in the patient's lungs, which decreases lung functioning and contributes to other medical complications such as pneumonia (Berge & Patterson, 2004). With increasing severity of the illness comes the need for more frequent treatments which may include oral medications, dietary restrictions, and chest therapy administered by family members. There is also an increased potential for stress among family members (Berge & Patterson, 2004; Thompson, Gustafson et al., 1994).

In studies of adjustment to sickle cell disease, researchers have typically assessed illness severity in terms of illness phenotype, medical complications, and painful episodes (Gil, Williams, Thompson, & Kinney, 1991; Thompson, Gil et al., 1992; Thompson, Gil et al., 1994; Thompson, Gil et al., 1993a, 1993b; Thompson et al., 1998; Thompson, Gustafson et al., 1992a). Phenotype identifies the genetic type of sickle cell disease such as hemoglobin sickle cell disease, sickle beta thalassemia syndromes, and sickle cell anemia. The main indicator of these types of diseases is the presence of abnormal, sickle-shaped red blood cells which block blood flow and lead to medical problems such as infections, renal complications, ocular complications, tissue and organ damage, and leg ulcers (Gil et al., 1991; Hocking & Lochman, 2005; Kelch-Oliver, Smith, Diaz, & Collins, 2007; Thompson, Gil et al. 1992; Thompson, Gil et al., 1993a, 1993b; Thompson, Gil et al., 1994;). People who have sickle cell disease experience bouts of severe pain that occur unpredictably and may last for several days, sometimes requiring hospitalization (Gil et al., 1991; Hocking & Lochman, 2005). As with other chronic illnesses

such as cystic fibrosis, treatment regimens help alleviate the pain and curb other symptoms, but there is no cure for the illness.

ii. Demographic parameters

The demographic parameters in the transactional model are the gender and age of the child or adult who has the illness and his or her SES (Thompson & Gustafson, 1996; Thompson, Gil et al., 1992; Thompson, Gil et al., 1993a, 1993b; Thompson Gil et al., 1994; Thompson et al., 1998; Thompson, Gustafson, Hamlet, & Spock, 1992a, 1992b). These attributes have also been referred to as generic parameters because they do not vary based on the illness (Thompson, Gil et al., 1992; Thompson, Gil et al., 1993b; Thompson, Gustafson et al., 1992b). Like the illness parameters, though, the demographic factors influence the mother and child's appraisal of the illness.

iii. Cognitive processes

Both the illness parameters and demographic parameters in the transactional model have a direct influence on the adaptation processes of the mother and child (Thompson & Gustafson, 1996; Thompson, Gil et al., 1993a, 1993b; Thompson, Gustafson et al., 1992a; Thompson, Gustafson et al., 1994). For the mother, the key adaptation processes in the model are cognitive processes, coping methods, and family functioning; for the child, the key adaptation processes are cognitive processes and coping methods. The key types of cognitive processes, which are based primarily on implications for clinical practice, are appraisals of the stress associated with illness tasks and daily hassles with which the parent or other adult must contend and

expectancies related to the parent's ability to control the illness (Thompson, 1985; Thompson, Gil et al., 1992; Thompson, Gil et al., 1993a, 1993b; Thompson & Gustafson, 1996; Thompson, Gustafson et al., 1992a, 1992b; Wallander & Thompson, 1995).

Drawn from the work of Lazarus and Folkman (1984), cognitive appraisal is the process of assessing the threat posed by the illness and the availability of resources to manage the threat (Thompson, Gil et al., 1992; Thompson, Gil et al., 1993a; Thompson et al., 1994; Thompson & Gustafson, 1996; Thompson, Gustafson et al., 1992a). As conceptualized by Lazarus and Folkman, cognitive appraisal occurs in two forms: primary and secondary. During the primary appraisal of an event, which typically occurs rapidly and often unconsciously, a person determines whether the event poses a threat or a challenge to his or her goals, commitments, and values. The main basis of this appraisal is the person's belief about his or her ability to control the event. As a result of these beliefs, the person appraises the significance of the event as irrelevant, benign-positive, or stressful. An appraisal that the event is irrelevant suggests that it has no implication for the person's sense of well-being. An appraisal that the event is benign-positive suggests that it has the potential to enhance or at least preserve the person's sense of well being. In contrast, an appraisal that the event is stressful signifies that the person believes that the event will pose some type of harm, threat, or challenge. Harm may be in reference to physical conditions or functioning (such as losing mobility) or psychological states (such as lowering self-esteem). In contrast to harm, which implies that the person has already begun to experience a loss, threat refers to a future loss. Challenge also contrasts with harm in that the

former appraisal focuses on the potential for gains or mastery and typically involves emotions such as pleasure and excitement, whereas an appraisal of threat typically involves negative emotions such as fear and anger.

The aspects of primary appraisal that are explicit in the transactional model are the stressfulness of both the illness tasks and daily hassles that the parent or other adult must contend with (Thompson, Gil et al., 1992; Thompson, Gustafson et al., 1992a, 1992b). The illness tasks examined in the transactional model are a subset of the seven sets of adaptive tasks identified by Moos and Schaeffer (1984) in their model of illness as a life crisis. The first illness task examined in the transactional model focuses on managing the child's medical issues, which Moos and Schaeffer (1984) identified as dealing with the symptoms of the illness and the treatment environment. Examples of these types of tasks include coping with intense bouts of pain, undergoing hospitalization for breathing treatments, and using effective communication strategies with nursing staff about quality of care or concerns about treatment regimens. The other three illness tasks examined in the transactional model, which relate indirectly to the illness, involve maintaining the well-being of the child, maintaining the well-being of the mother, and dealing with the future uncertainty (Thompson, Gil et al., 1992; Thompson, Gil et al., 1994; Thompson, Gustafson et al., 1992, Thompson, Gustafson et al., 1998). Drawn from the work of Moos and Schaeffer (1984), tasks aimed at preserving emotional balance target negative emotions such as guilt and anger that are associated with the illness. Similarly, tasks related to self-image involve revising the individual's self-image amid changes in his or her level

of functioning or appearance due to the illness. The tasks involved in coping with uncertainty

relate to dealing with the threat posed by the illness and maintaining a sense of hope.

Daily hassles are the relatively minor stresses that occur in everyday life such as driving

in congested traffic (Kanner, Coyne, Schaefer, & Lazarus, 1981; Kohn, 1996; Lazarus &

Folkman, 1984; Wheaton, 1996). Taken as isolated events, daily hassles typically generate little

psychological distress or result in acute but relatively short episodes of distress. The weight of

their impact is largely a function of their accumulation (Herbert & Cohen, 1996; Kohn, 1996;

Patterson, 1988). For example, a person who encounters heavy traffic congestion after

experiencing a series of overlapping stressful events may feel overwhelmed by the stresses

associated with the hassles whereas a person who experiences only the traffic congestion may

feel little or no distress. In studies that have examined the stress associated with daily events

versus major life events, researchers have generally found that daily hassles accounts for

substantially more variance in outcome variables than life events do (Lazarus & Folkman, 1984).

During a secondary appraisal of an event, the person determines what he or she can do

about the harm, threat, or challenge appraisal and evaluates possible courses of action (Lazarus

& Folkman, 1984). Although semantically the term *secondary* conveys that primary appraisal

precedes secondary appraisal and that the latter is lesser in importance, Lazarus and Folkman

pointed out that the two forms may occur in tandem and are not more or less important relative to

one another. For example, a person may simultaneously ascertain that a particular situation

poses a challenge rather than a harmful threat and immediately begin acquiring resources to

master the challenge. Expectancy plays a key role as the person considers what resources are available, what he or she can do to cope, and what his or her expectations are for the outcomes of particular actions. This process involves weighing actions in terms of their feasibility, the likelihood that they will produce the desired outcome, and the likelihood that the person can successfully execute them. Drawing from the work of Bandura (1986), Lazarus and Folkman identified two types of expectancies: outcome expectancy and efficacy expectancy. Outcome expectancy is the "person's evaluation that a given behavior will lead to certain outcomes" (Lazarus & Folkman, 1984, p. 35). For example, a person with a high level of outcome expectancy would believe that taking a particular action is likely to have a particular result. This expected outcome, however, does not necessarily mean that the person could or would take that particular action. His or her efficacy expectancy often mediates the connection between the outcome expectancy and the action taken. Efficacy expectancy is the person's beliefs that he or she has the requisite skills to perform a particular task (Bandura, 1986). This belief influences the person's thoughts, behaviors, and persistence with challenging tasks (Bandura, 1986; Thompson, Gil et al., 1994). Generally individuals who have higher levels of self-efficacy tend to persist in challenging tasks whereas individuals with relatively low levels tend to give up more quickly. The latter type of person is also more likely to perceive tasks to be more difficult than they really are, thereby increasing the person's distress. Hence, taking action involves not only recognizing that the action *could* produce a particular result but also believing that the person is capable of performing the action (Lazarus & Folkman, 1984). In the context of the transactional

model, efficacy expectancy is a person's belief that he or she can successfully manage the tasks associated with the illness (Lazarus & Folkman, 1984; Thompson, Gil et al., 1992; Thompson, Gil et al., 1993a; Thompson et al., 1994; Thompson & Gustafson, 1996; Thompson, Gustafson et al., 1992a).

iv.   <u>Locus of control</u>

The other component of expectancy in the transactional model is the parent's locus of control related to the illness (Thompson, Gil et al., 1993a, 1993b). Similar to general locus of control, which refers to "the extent to which people assume they can control events and outcomes of importance" (Lazarus & Folkman, 1984, p. 66), illness locus of control refers to the extent to which people believe that they can control the illness. Viewed as a dichotomy, a person tends to have either an internal or external locus (Lazarus & Folkman, 1984). A person with an internal illness locus of control believes that positive and negative aspects of the illness are the results of his or her actions or behaviors, whereas a person with an external locus believes that external factors in the environment rather than his or her actions control the illness. The implication of the person's relative position along this continuum is that it affects his or her coping strategies (Lazarus & Folkman, 1984; Thompson & Gustafson, 1996). For example, having a strong belief that fate controls the course of an illness may contribute to decreased use of problem-focused coping strategies (Lazarus & Folkman, 1984).

v.   <u>Coping methods</u>

The second set of maternal adaptation processes hypothesized to influence adjustment in the transactional model is method of coping. Drawing from Lazarus and Folkman's (1984) distinction between methods of coping in terms of whether they served emotion-focused or problem-focused functions, the transactional model examines two types of coping methods: palliative and adaptive (Thompson, Gustafson et al., 1992). The function of palliative coping is to regulate or control emotional states (Lazarus & Folkman, 1984; Thompson & Gustafson, 1996), whereas the function of adaptive, problem-focused coping is to manage or alter the situation (Lazarus & Folkman, 1984; Thompson, Gil et al., 1994). Examples of emotion-focused coping strategies used to alleviate emotional distress include minimization, avoidance, distancing, and selective attention (Lazarus & Folkman, 1984). Other examples of coping strategies in this domain, as identified by Moos and Schaefer (1984), include referring to oneself in a detached manner (affective regulation), screaming (emotional discharge), and deciding that the course of events cannot be altered (resigned acceptance). Examples of coping strategies used to increase emotional distress include self-blame and self-punishment (Lazarus & Folkman, 1984). Lazarus and Folkman also identified a form of reappraisal as an emotion-focused coping strategy. In this case the person changes the subjective meaning of the stressful situation thereby altering the threat posed by the situation. Research has shown that emotion-focusing coping is more likely to be associated with appraisals that the person cannot alter the situation (Lazarus & Folkman, 1984) and poor adjustment outcomes (Thompson, Gil et al., 1994).

The function of problem-focused coping strategies is to address or solve a particular problem (Lazarus & Folkman, 1984). Similar to general problem-solving strategies, problem-focused coping may aim to alter aspects of the environment. Problem-focused coping also includes strategies that are directed inward. Examples of such strategies include seeking information and learning new skills, adopting new behaviors, and modifying aspirations. According to Lazarus and Folkman, problem-focused coping is more likely to occur when the person appraises a situation as changeable. However, the relationship between problem-focused coping and emotion-focused coping is complex in that one strategy may influence the selection of another strategy both across and within the typology.

vi. Family functioning

The third set of adaptation processes that influence adjustment according to the transactional model is family functioning (Thompson, Gil, et al, 1992a, 1992b; Thompson, Gil et al., 1994). Within this framework, family functioning is viewed as a type of social support for the mother. Drawn from the Family Environment Scale (FES) and analyses by Kronenberg and Thompson (1990), family functioning in the transactional model is a multilevel, multidimensional construct. As conceived by Moos and Moos (1983, 1994), there are three higher-order dimensions of family functioning: interpersonal relationships, personal growth, and family system maintenance. The relationships dimension, which focuses on the interactions between family members, comprises three elements: cohesion, expressiveness, and conflict. Cohesion represents how well the family members support one another and are mutually

committed to one another. Expressiveness refers to the extent that family members openly

express their feelings to one another. Conflict refers to the level of anger and aggression that

family members exhibit towards one another. Within the personal growth dimension there are

five key aspects of family functioning: independence, achievement orientation, intellectual-

cultural orientation, active-recreational orientation, and moral-religious emphasis. None of these

elements, however, are directly part of the transactional model. Within the system maintenance

dimension, there are two key aspects of family functioning: organization and control.

Organization refers to the level of structure that is present in the family, and control refers to the

extent to which the family operates in accordance with a set of rules.

As reallocated by Kronenberg and Thompson (1990), the aspects of family functioning in

the transactional model define three slightly different higher-order dimensions: supportiveness,

conflict, and control (Thompson, Gil et al., 1992; Thompson, Gil et al. 1993a; Thompson, Gil et

al., 1994; Thompson, Gustafson et al., 1992b). Supportiveness refers to the extent to which the

family is mutually committed to its members (Kronenberg & Thompson, 1990). In contrast to

the positive aspects of a supportive family environment, a conflicted family environment is one

in which there is a lack of mutual commitment as well as high conflict and poor organization

within the family unit. Moreover, this type of family functioning tends to predict maladjustment.

Control in the context of family functioning refers to the extent to which the family operates in

accordance with a set of rules. The control factor represents the emphasis that the family unit

places upon ethical and religious values, achievement, and independence. Overall the family's

supportiveness and cohesion help facilitate the coping process and mediate stress outcomes, whereas a high degree of conflict within the family tends to exacerbate stress and contribute to adjustment problems among the mother and child (Thompson, Gil et al., 1992; Thompson, Gil et al., 1993a, 1993b).

vii.   Psychological distress

Maternal adjustment in the transactional model focuses mainly on the symptoms of psychological distress (Thompson, Gil et al., 1993a, 1993b; Thompson & Gustafson, 1996; Thompson, Gustafson et al., 1992a, 1992b). Of primary relevance in the model are the levels of symptoms of anxiety, depression, and overall distress exhibited by the mother. These symptoms encompass nine aspects of psychological distress as defined by the Symptom Checklist 90-Revised (SCL-90-R): anxiety, depression, hostility, interpersonal sensitivity, obsessive-compulsive, phobic anxiety, paranoid ideation, psychoticism, and somatization. While there are many definitions and conceptualizations of anxiety (Derogatis, 1994; Derogatis & Wise, 1989; Lazarus & Folkman, 1984), the transactional model incorporates anxiety as a stress response. Under this perspective, anxiety is an uncomfortable or unpleasant feeling that arises in reaction to a future or anticipated event (Derogatis, 1994; Derogatis & Wise, 1989; Derogatis, Lipman, & Covi, 1973). Somatic symptoms of anxiety include breathlessness, weakness, and sleeplessness. Symptoms of depression include a dysphoric mood, a sense of hopelessness, appetite interference, and fatigue. Both anxiety and depression contribute to overall distress along with the other seven scales of the SCL-90-R.

b. **<u>Measurement with the transactional model</u>**

The instruments used to measure the components of the model have been relatively

consistent across research studies applying the transactional model. The main variation has been

the use of illness-specific measures depending on the illness being studied. For example, in

studies of adjustment to cystic fibrosis, researchers have typically measured illness severity using

the Shwachman Clinical Evaluation System (Thompson et al., 1998; Thompson, Gustafson,

Hamlet, & Spock, 1992a, 1992b). Measures of the other parameters, such as demographics,

cognitive processes, coping methods, family functioning, and adjustment, have been fairly

universal. This section provides an overview of the instruments used to produce these measures

as well as some of the criticism about their characteristics and usage. It also provides a

foundation for several of the measurement-related changes made in the study of caregiver

adjustment.

i. **<u>SES</u>**

Researchers have typically measured SES in the transactional model in terms of

Hollingshead's two-factor index of social position (Thompson, Gil et al., 1992; Thompson et al.,

1993; Thompson, Gustafson et al., 1992a, 1992b; Thompson, Gustafson et al., 1994). This index

comprises two weighted components: education and occupation. The educational component is

based on a 7-point scale with scores assigned according to the individual's highest level of

education, ranging from graduate or professional training down to 7 or fewer years of schooling

(Miller, 1983). The occupational component is also based on a 7-point scale with scores

assigned according to the size and value of the profession. Occupations ranked highest correspond to professional positions, whereas occupations ranked lowest consist mainly of unskilled jobs. Combining the education and occupation scores using weight factors produces an index of social position. Based on this index, the person's SES is one of five ordinal levels ranging from I (high SES) to V (low SES).

Although researchers have widely used Hollingshead's two-factor index in the social sciences (Bornstein, Hahn, Suwalsky, & Haynes, 2003; Hauser & Warren, 1997; Miller, 1983), the instrument and the updated four-factor index have been the subject of much criticism. In addition to the age of the index being an issue, much of the criticism centers on the lack of validity-related evidence to support various characteristics of the index (Duncan & Magnuson, 2003). Two of the main points of contention relate to the tenuousness of Hollingshead's rationale for stratifying SES into five uneven intervals (ranging from 6 to 16 points) and a weak justification for the stratification of education into seven levels (Haug, 1977). According to Haug, strong theoretical bases for these distributions are lacking. Another criticism leveled by Haug (1977) and Hauser and Warren (1997) is the sample-dependence of the occupation list used as a proxy for SES. As the initial occupation levels were based on a specific study conducted by Hollingshead, their representativeness is relative to the sample used in the study rather than to a broader population of occupations such as the U.S. Census. The rank ordering of the educational component of the index also poses potential confounds due to the changing nature of education and training, especially as companies provide employees with additional educational

opportunities and specialized training (Haug, 1977). Even within an SES level there may be considerable variation among individuals in terms of educational attainment.

ii.   Cognitive appraisal

For cognitive appraisal in the transactional model, researchers have generally assessed the appraisal of the illness tasks in terms of how stressful they are for the parent or other adult (Thompson, Gil et al., 1992; Thompson, Gustafson et al., 1992a, 1992b). Measures have included a continuous scale score ranging from 1 to 100 for each illness task and a summed scale score for the collective illness tasks. While this type of continuous measure can potentially provide a direct estimation of the level of stressfulness that the respondent has experienced, it is also subject to several of the same assumptions and limitations as visual analog scales in which respondents indicate their level of the construct of interest at any position between the anchors of the scale. One of these assumptions is that the degree of precision inherent in the respondent's mark on the scale is comparable to the precision inherent in the attribute being measured (Streiner & Norman, 2008). In the case of a verbally administered stressfulness scale, the assumption would be that a respondent's ability to report a stressfulness rating of 77.7, for example, would correspond to the actual precision at which stressfulness could be measured. Another assumption underlying the use of these types of continuous scales is that the respondents will reliably use the entire range of the scale.

Measures of the appraisal of daily hassles in the transactional model have primarily focused on the frequency and severity as measured by a composite score from the Hassles scale

(Thompson, Gil et al., 1992; Thompson, Gil et al., 1993a, 1993b; Thompson & Gustafson, 1992b). The version of the instrument used in many studies on the transactional model consists of 117 items rated on a 3-point scale from in terms of how severely the respondent has experienced the corresponding event in the past month (Kanner et al., 1981). The instrument produces three summary scores for daily hassles measuring their frequency, cumulative severity, and intensity. The frequency score corresponds to the number of hassles checked by the respondent, and the sum of the item ratings is the severity score of the collective hassles. Dividing this cumulative severity by the frequency produces the intensity score.

Although regression analyses conducted by Kanner et al. (1978) indicate that hassles may explain a significant proportion of the variance in measures of psychological symptoms, other researchers have raised concerns about the Hassles scale and the validity of inferences made from its results. One of these concerns is whether the items truly represent daily stresses rather than events that may be more episodic (Wheaton, 1996). According to Wheaton, items that refer to events such as loss of employment or marital separation do not appropriately align with the definition of daily hassles. Another prevalent criticism of the Hassles scale is the potential confounding of item content as both sources and symptoms of distress (Dohrenwend & Shrout, 1985; Dohrenwend, Dohrenwend, Dodson, & Shrout, 1984; Holm & Holroyd, 1992; Kohn, 1996; Wheaton, 1996). For example, some of the items refer to alcohol and drug use, physical illness, and sexual dysfunction, which Kohn (1996) viewed as symptoms rather than sources of distress. Literature on the impact of personality traits on health also supports this argument, as

physical ailments and substance abuse are often cited as outcomes of personality traits such as neuroticism (Taylor & Aspinwall, 1996). Citing the results of item reviews by clinical psychologists, Dohrenwend et al. (1984) and Dohrenwend and Shrout (1985) supported similar arguments that many of the items on the scale represent psychological symptoms rather than routine hassles.

Factor analysis has been the other primary approach used to investigate the potential overlap between the Hassles scale and measures of psychological distress, and the results have both defended and refuted the structure of the instrument and subsequent modifications. For example, Lazarus, DeLongis, Folkman, and Gruen (1985) extracted an eight-factor solution representing hassles in different areas. Addressing criticisms about the scoring model used to rate the hassles, Holm and Holroyd (1992) examined the factor structure of a revised version of the scale and found evidence that it yielded measures of hassles that were district from the measures of distress obtained from the Beck Depression Inventory and the Wahler Physical Symptom Checklist. However, there was some potential overlap among the distress symptoms and the factor identified as "inner concerns". Given the similarity between some of these indicators and the items on the SCL-90-R, additional analyses would be needed to fully explore the potential overlap between daily hassles and symptoms of distress as measured by the SCL-90-R subscales.

Researchers have typically measured efficacy expectancy in the transactional model by the parent's confidence in his or her ability to handle the illness tasks (Thompson, Gil et al.,

1993a, 1993b; Thompson, Gil et al., 1994). Typically collected via an interview, the parent rates

his or her certainty about being able to handle each illness task on a scale from 1% to 100%

(Thompson, 1985; Thompson, Gil et al., 1992; Thompson, Gil et al., 1994; Thompson &

Gustafson, 1996; Thompson, Gustafson et al., 1992b). The individual scores have provided a

measure of the efficacy associated with each task, and the summed scale scores have provided a

measure of the efficacy associated with the collective tasks.

iii.   Locus of control

For measures of the mother's locus of control in the transactional model, researchers have

commonly used the Multidimensional Health Locus of Control (MHLC) scales (Thompson, Gil

et al., 1993a, 1993b; Thompson, Gil et al., 1994; Thompson, Gustafson et al., 1992b). The

MHLC, which was developed by Wallston, Wallston, and DeVeliss (1978), is a self-report

instrument designed for adults who read on an eighth-grade level or higher and lack functional

impairments. There are two parallel forms of the instrument (Form A and Form B), and each

version comprises three scales intended to measure respondents' beliefs about the factors that are

responsible for health outcomes: internal (IHLC), powerful other (PHLC), and chance (IHLC).

Individuals who have high IHLC scores tend to attribute their health outcomes to their own

actions rather than to external forces. In contrast, individuals who have high PHLC scores tend

to attribute their health outcomes to other people or beings, whereas individuals who have high

CHLC scores tend to attribute their health outcomes to chance.

The MHLC is one of the few scales used with the transactional model that has undergone Rasch analysis. Rasch analysis refers to the application of a set of probabilistic models derived by Georg Rasch and used to predict response patterns and discern how well the responses fit the model across both items and respondents (Bond & Fox, 2007; Linacre, 2013). One of the basic principles of the Rasch model is that a person who has more of a particular latent trait is more likely than a person who has less of the trait is to endorse an indicator of that trait. In terms of items, the ease of endorsement is represented by item difficulty (also referred to as the item measure). For any respondent, the probability of endorsing an item that has a relatively high difficulty is less than the probability of endorsing an item that has a lower difficulty. In the context of polytomously scored data such as scores obtained from the MHLC, a person who has a higher locus of control in any orientation would endorse indicators of the trait by selecting higher response categories (e.g., *strongly agree* over *agree*). Similarly a person who has relatively low levels of the trait would be more likely to select lower response categories (e.g., *strongly disagree* over *disagree*). Mathematically the probability of selecting a particular response category (*j*) is a function of $\log(\pi_{nij} / \pi_{ni(j-1)}) = \beta_n - \delta_i - \tau_j$ (Smith, 1999), where β_n is the *n*th person's measure of locus of control, δ_i is the difficulty of the *i*th item, and τ_j is the difficulty in going from the [*j*-1]th category to the *j*th category). Among the benefits of using Rasch analyses are the transformation of raw scores to a true linear metric, which is one of the requisite conditions for meaningful measurement, when the data fit the requirements of the model (Bond & Fox, 2001; Elliott, Fox, Beltyukova, Stone, Gunderson, & Zhang, 2006; Gehlert

& Chang, 1998; Kelly et al., 2007; Smith, 1999). For data fitting the Rasch model, measures of both the items and respondents share a common interval scale without the items estimates being dependent upon the characteristics of a particular sampling of individuals or the estimates of the individuals being dependent upon the characteristics of a particular sampling of items. These estimates enable the analyst to predict response patterns based on probabilities and compare the actual responses to the model to discern how item or person responses fit the predicted model.

Using a combined approach of Rasch analysis and confirmatory factor analysis, Gehlert and Chang (1998) investigated of the structure of Form A of the MHLC scales obtained from a sample of adults who had been diagnosed with epilepsy. Fit statistics from the factor analysis of the raw MHLC scores indicated that the theorized three-factor model did not yield a good fit of the data, but the results of Rasch principal components analyses of the response residuals supported the factor structure proposed by Wallston et al. (1978). Unlike a traditional factor analysis in which the analyst uses raw scores to identify common factors among the items, a Rasch principal components analysis examines the explained and unexplained residual item variance within the modeled dimension (Linacre, 2013; E. V. Smith, 2004a). Similarly, Kelly et al. (2007) also found mixed support for the theorized dimensionality of the MHLC scales using data from three populations who were affected by osteoarthritis and a control sample across three research studies. A subset of the fit statistics from a confirmatory factor analysis indicated that the theorized three-factor model did not yield a good fit of the data, but the results of a Rasch principal components analysis supported the item assignments across the three scales.

The results of the Rasch analyses conducted by Gehlert and Chang (1998) also provided insight into problematic items in the MHLC scales, specifically through the examination of item fit statistics. In Rasch analysis, these statistics provides an indication of how much the observed responses deviate from the responses predicted by the Rasch model (Bond & Fox, 2001; Linacre, 2004; Smith, 1999; Wolfe & Smith, 2007b). Items that exhibit misfit, which some Rasch analysts consider to be a mean-squared statistic over 1.3 or 1.5 depending on the sample size, are problematic in terms of the amount of noise inherent in the measure (Bond & Fox, 2001; Linacre 2004, 2013). This condition indicates significant deviations between the actual responses to the items and the responses predicted by the Rasch model, potentially due to a variety of factors such as technical issues with the item, inconsistent usage of response categories by the respondents, and other confounding interactions with the item responses. Given that high misfit could suggest that the corresponding items measure their respective traits slightly differently from the other items in the scale, item fit further provides evidence of the dimensionality of the items.

This type of diagnostic information provides insight into potential contributors to the conflicting results of factor analyses of the raw scores. In the confirmatory factor analysis of the theorized three-factor structure conducted by Gehlert and Chang (1998), the four items that exceeded their criterion for misfit had the lowest factor loadings within their respective scales in Gehlert and Chang's confirmatory factor analysis of the theorized three-factor structure. The results of the study conducted by Kelly et al. (2007) were similar although all of the items had fit mean-squared fit statistics within the recommended ranges. With the responses to the items with

the highest misfit removed from the data, the results of both the Rasch analysis and confirmatory factor analysis indicated that the model fit had improved.

Kelly et al. (2007) also examined the MHLC scales for the presence of differential item functioning (DIF) based on research study and gender and found that none of the 12 items that exhibited DIF exceeded the criterion for a moderate DIF effect based on ranges proposed by Linacre (2013). This finding was consistent with the gender-related findings of Wallston et al. (1978) in the validation study in which they tested correlations among the MHLC subscales and gender, age, and education. When DIF exists at the item level, the item difficulty estimates differ for two or more subgroups within a sample after controlling for ability, thereby limiting the meaningfulness of comparisons among the subgroups in terms of aggregated scores such as means (Bond & Fox, 2001; E. V. Smith, 2004b). In the case of rating scales used for diagnostic purposes, DIF could result in under- or over-diagnosis of individuals in a particular group. Group comparisons made between the groups in terms of the latent trait are tenuous when DIF exists in any of the items under comparison. Rasch measurement enables detection of DIF by comparing the item difficulties for each subgroup being examined and testing the differences for statistical significance (Linacre, 2013).

Rasch measurement has also enabled the analysis of the functioning of the response scale of the MHLC and empirical examination of the assumption of appropriately ordered response categories and category thresholds. The threshold value indicates the level of difficulty in selecting a particular response category over an adjacent category. In an optimally functioning

rating scale, category thresholds should increase as the response categories increase in category value. For example, in the case of the MHLC scales the category threshold between the two highest response categories (*moderately agree* and *strongly agree*) should be higher than the category threshold between the second and third highest response categories. This pattern of monotonic increase should hold for all of the categories, but Kelly et al. (2007) found some degree of disordering among all of the items across the four samples. Common causes of threshold disordering include infrequent or idiosyncratic use of a particular response category (Linacre, 2013), which may occur when respondents have difficulty distinguishing between similar response categories (Streiner & Norman, 2008). For example, respondents may not be able to reliably distinguish between the *moderately agree* and *slightly agree* categories, or they may interpret *slightly* as a higher degree than *moderately*, which is opposite of the intended use of the scale. Upon collapsing of adjacent categories into a 4-point scale, Kelly et al. (2007) found that it corrected some of the disordering but did not eliminate the item misfit. Additional analyses with a smaller scale seem warranted to improve the interpretability of the response categories and investigate the impact on other properties of the scale.

iv.   Coping methods

A scale commonly used to measure coping methods in the transactional model has been a variant of the Ways of Coping questionnaire (Thompson, Gil et al., 1992; Thompson, Gustafson et al., 1992b; Thompson, Gustafson et al., 1994). The version of the instrument used in the studies contained indicators of various coping behaviors that the respondent rated in terms of

how often he or she had used them. The indicators form a palliative dimension and an adaptive

dimension of coping. The palliative dimension contains items measuring avoidance, wishful

thinking, self-blame, and other emotion-focused coping methods. In contrast, the adaptive

dimension contains items measuring cognitive restructuring, information seeking, social support

seeking, and other forms of problem-focused coping. In some studies there has also been an

additional measure of percentage palliative coping, which is the ratio of palliative coping to

palliative plus adaptive coping (Thompson, Gil et al., 1994).

The original Ways of Coping questionnaire contained dichotomously scored items that

respondents answered *yes* or *no* about whether they had used the strategy in relation to a specific

stressor (Folkman & Lazarus, 1980). The main intent of the instrument was to distinguish

between the use of problem-focused strategies and emotion-focused strategies in coping with a

stressful event. To provide empirical support for the theory-driven classification of items,

Folkman and Lazarus conducted a principal factor analysis of the data from respondents who

participated in the validation study of the Hassles scale (Kanner et al., 1981). Although Folkman

and Lazarus reported that the overall results of the factor analysis provided evidence to support

the two-factor structure, the small sample size relative to the number of factor posed a threat to

the validity of the results. There are varying guidelines about the number of cases required to

produce reliable factor estimates, with recommendations ranging from 2 to 20 times the number

of variables being analyzed (Stevens, 2009). Other literature recommends conducting factor

analysis with sample sizes of 300 or more cases (Stevens, 2009; Tabachnick & Fidell, 2007).

From other analyses of the Ways of the Coping questionnaire, researchers have identified several additional dimensions among the items (Vitaliano, Russo, Carr, Maiuro, & Becker, 1985). One of these conceptualizations was a seven-factor structure representing problem-focused coping and six types of emotion-focused coping: wishful thinking, growth, minimizing threat, seeking social support, blaming self, and a mix of both avoidant coping strategies and help-seeking strategies. From a validation study of the revised Ways of Coping Checklist Vitaliano et al. (1985) produced a similar five-factor structure of coping methods labeled as problem-focused, blamed self, wishful thinking, seeks social support, and avoidance. These differences in factor structure highlight concern for the lack of replicability of the factor structure across administrations of the instrument (Schwarzer & Schwarzer, 1996; Skinner, Edge, Altman, & Sherwood, 2003). Conflicting results of exploratory factor analyses conducted on the questionnaire and similar instruments that measure coping methods have yielded a proliferation of classification schemas (Skinner et al., 2003). One of the conditions that has contributed to this problem is the lack of conceptual and functional clarity in defining what the resultant factors are. Although this problem is not a direct result of the use of factor analysis methods to categorize ways of coping, it is one of the common challenges of this type of analytic approach (Tabachnick & Fidell, 2007). Another problem that has threatened the validity of the results of these approaches to classifying ways of coping is the representativeness of the items (Skinner et al., 2003). Without a comprehensive pool of indicators, it is difficult to ensure that the factors extracted from the items can adequately and fully describe the diverse ways in which people

respond to a variety of stressful situations. Attention to comprehensiveness is one of suggestions that Skinner et al. (2003) made for improving the utility and validity of the results of assessments of coping methods. Other recommendations included ensuring that categories used to describe coping methods are conceptually clear, mutually exclusive, functionally homogeneous, and functionally distinct. Additionally the categories used to describe coping methods need to be applicable across a wide range of coping contexts, stressors, and demographics. Related to the development of future classification schemas, Skinner et al. advocated developing and refining hierarchical classification systems rather than the traditional lower-order systems such as the categorization of the Ways of Coping Questionnaire and similar instruments. The advantages of hierarchical classification systems are that they enable the identification of families of coping methods and can better represent the multidimensional nature of coping.

<p style="text-align:center">v.   <u>Family functioning</u></p>

The components of family functioning in the transactional model are based on the FES items but apply Kronenberg and Thompson's (1990) factor structure (Thompson, Gil et al., 1993a; Thompson, Gil et al., 1994). Designed to measure perceptions of a family's social climate (Moos & Moos, 1983, 1994), the FES has been a widely used instrument in research on family dynamics and organization (Blankfeld & Holahan, 1996; Moos & Moos, 1983). For each of the 90 dichotomously scored items on the instrument, the respondents indicate whether the underlying characteristic is primarily true or not true of their families (Loveland, Cherry, Youngbilt, & Kline Leidy, 1989; Moos & Moos, 1983, 1994). As outlined by Moos and Moos

(1983, 1994) the FES comprises 10 subscales across three higher order dimensions: relationship, personal growth, and system maintenance. Subscale scores are obtained by counting the corresponding number of endorsed items. There are also three parallel forms of the instrument (*R*, *E*, and *I*) that have the same items but slightly different usages for measuring the individual's perception of the real, expected, or ideal functioning of his or her family, respectively.

In studies on the transactional model, researchers have commonly used the three-factor solution based on the supportive, conflicted, and controlling factors examined by Kronenberg and Thompson (1990). Yet there has been conflicting research supporting both the factor structure of the FES and the combining of data for spouses. A possible contributor to this issue is the potential DIF in the items based on which parent completed the FES. As the results of an analysis conducted by Loveland-Cherry et al. (1989) suggested, combining the data of mothers and fathers into one analysis could produce slightly different factor structures compared to separate analyses by gender.

An examination conducted by Chipuer and Villegas (2001) revealed differences in the factor structure for husbands and wives, which threatens the validity of results obtained from aggregating the scores of individual family members to obtain an overall family score or making direct comparisons between the parent's total scores. Rather than using the dichotomous scoring, though, Chipuer and Villegas (2001) scored items on a 5-point Likert scale anchored by *strongly disagree* and *strongly agree*, and the sum of the items in each subscale provided the subscale scores. Using SEM to examine potential differences in various two- and three-factor

structures among the husbands and wives, Chipuer and Villegas (2001) found that a similar factor structure would apply for both husbands and wives and that a two-factor solution provided the best fit. The analyses revealed no significant differences between the factor loadings for the husbands and wives in the two-factor solution but that there were significant differences in the error variances. While the findings suggested that the results were comparable for husbands and wives, there was at least some difference in the way that the scales measured their perceptions. Additional analyses using a Rasch framework would be beneficial for examining potential differences at the item level.

vi.   Psychological adjustment

As with the other measurement instruments used with the transactional model, there have also been concerns about the factor structure of the SCL-90-R, which is the instrument that researchers applying the transactional model have commonly used to operationalize maternal adjustment (Thompson Gustafson., 1992a, 1992b; Thompson & Gustafson, 1996; Thompson, Gil et al., 1993a, 1993b). This self-report instrument consists of 90 stress indicators that respondents rate in terms of the extent to which they have experienced each symptom within the past week. Based on a 5-point scale, the instrument produces scale scores for nine dimensions of stress: anxiety, depression, hostility, interpersonal sensitivity, obsessive-compulsive, phobic anxiety, paranoid ideation, psychoticism, and somatization (Derogatis & Wise, 1989), as well as a global severity index (GSI) as an overall indicator of distress.

Addressing concerns about the functioning of the SCL-90-R and potential measurement

limitations that could threaten the validity of results obtained from the instrument, Elliott et al.

(2006) examined the functioning of the rating scale as well as reliability indices and item

measures for the SCL-90-R. They found that all of the category thresholds increased with the

increasing response category value, which indicated that the category thresholds were

appropriately ordered and were used as intended. The threshold distances, however, did not

meet recommended guidelines for being statistically distinct from one another. For a 5-category

rating scale, Linacre (2004) has recommended a minimum step distance of 1.0 logit as a criterion

for statistical distinction and a maximum step distance of 5.0 logits to avoid a loss of category

precision. None of the category thresholds reported by Elliott et al. met this condition; the

smallest step distance was 0.05 (between the second and third response categories), and the

largest was 0.55 (between the fourth and fifth response categories). These results indicated that

the thresholds were extremely narrow. Upon examining several category structures, Elliott et al.

found that a 3-point scale combining the two lowest response categories and the two second-

lowest response categories produced the optimal fit, reliability, and separation estimates with the

three misfitting items eliminated from the instrument.

In terms of DIF across the two samples in the study, Elliott et al. (2006) found that 15 of

the items on the SCL-90-R were significantly more or less difficult to endorse for one of the two

samples. Eight of these items were significantly more difficult for participants in the sample

who were dealing with various psychological disorders to endorse, and seven of the items were

significantly less difficult for this group to endorse. None of the differences, however, were

substantive in terms of effect size. These results suggest that the condition of invariance applies

across the two samples of individuals with various depressive, affective, or psychological

disorders. It is important to note, however, that the results of the study may be subject to

violations of local independence (Elliott et al., 2006), which is one of the assumptions of the

Rasch rating scale model (Linacre, 2013). Under this assumption a set of item responses is

independent of the other sets after controlling for levels of the underlying trait being measured.

Violations of the assumption may result in underestimated standard errors for item estimates and

overestimated internal consistency reliability. Participants in the study received the SCL-90-R

following every counseling 10th session that they attended (Elliott et al., 2006). With the

repeated administration, a set of subsequent responses for a given participant would not be

independent of his or her previous set of responses especially if the counseling sessions had little

or no impact on the outcomes measured by the SCL-90-R. Elliott et al. used fit statistics to

examine evidence of overpredictability in the responses, which they found in approximately 10%

of the sample. Additional research with a sample in which each person's set of responses is

independent would be needed to further examine the dimensionality and rating scale functioning

of the SCL-90-R.

c. Research with the transactional model

There have been several studies using these measures to examine the adjustment of adults

and children to various illnesses with the transactional model as a theoretical framework. Most

of these studies have focused on identifying the prevalence of adjustment problems among mothers and children and the relationship between adjustment and various components of the model (Thompson, Gil et al., 1994; Thompson & Gustafson, 1996; Thompson, Gustafson, et al., 1992b; Thompson, Gustafson et al., 1994). A few studies have also examined the stability of adjustment over time (Thompson, Gustafson et al., 1994; Thompson, Gil et al., 1994).

In terms of illness parameters and generic parameters, researchers have generally not found significant differences between mothers who exhibit good versus poor adjustment based on clinical norms for the adjustment outcomes (Thompson, Gil et al., 1993a, 1993b; Thompson, Gustafson, et al., 1992b). Researchers have found significant differences, however, on the basis of various adaptation processes. For example, from a study of the influence of illness parameters, demographic parameters, maternal cognitive processes, coping methods, and social support on maternal adjustment to a child's cystic fibrosis, Thompson, Gustafson, et al. (1992b) found that there were no statistically significant differences between mothers who showed poor adjustment and mothers who showed good adjustment in terms of the severity of the child's illness. Nor were there significant difference between the groups in terms of the child's age, gender, or SES. Analyses of variance tests revealed significant differences between the good- and poor-adjustment groups in terms of appraisal of both daily stress and illness tasks, which were higher for the mothers in the latter group. There were also significant differences in the two groups in terms of efficacy expectations with lower levels among the mothers in the poor-adjustment group. Results of multiple analysis of variance tests revealed no significant

differences among the groups in terms of any of the locus of control orientations but did reveal differences in terms of both coping methods and family functioning. The mothers in the poor-adjustment group exhibited more palliative coping and had higher levels of family conflict but lower levels of family supportiveness compared to the mothers in the good-adjustment group.

Using univariate statistics, Thompson, Gil et al. (1993a) found no statistically significant differences among mothers of children with sickle cell disease who exhibited poor adjustment and mothers who exhibited good adjustment based on the illness parameters. This finding applied to both the frequency of painful episodes within the past 9 months and the number of illness-related complications within the past year. Nor were there significant differences between the two groups of mothers based on the demographic parameters. This finding applied to the child's age as well as gender and SES. There were significant differences in terms of appraisal of daily stress but not illness stress. Similar to the findings obtained by Thompson, Gustafson, et al. (1992b), Thompson, Gil et al. (1993a) found that mothers who exhibited poor adjustment had significantly higher appraisals of daily stress compared to the mothers in the good-adjustment group. The mothers who exhibited poor adjustment also exhibited more palliative coping methods compared to the mothers in the good-adjustment group. The groups did not differ in terms of their locus of control in any of the three orientations.

In a study of adjustment among adults with sickle cell disease, Thompson, Gil et al., (1992) used a variant of the transactional model to determine which factors mediated psychological distress. Similar to the studies conducted on children, the scales on which

participants exhibited distress were depression, anxiety, and GSI. There were no significant differences between the adults who exhibited good adjustment and the adults who exhibited poor adjustment with respect to gender, age or type of sickle cell disease. Nor were there significant differences between the groups based on whether they were at Hollingshead's (1957) three lowest SES levels compared to Level IV or Level V. There were significant differences among the groups, however, in terms of illness efficacy and cognitive appraisals. For both daily stress and illness stress the adults in the poor-adjustment group had higher means relative to the adults in the good-adjustment but lower means for illness efficacy. The groups also differed in terms of palliative coping but not adaptive coping. In terms of coping strategies, there were significant differences between the groups with respect to negative thinking/passive adherence but not coping attempts. In terms of family functioning, there were significant differences between the groups based on the supportive, conflicted, and controlling dimensions of family environment.

Using forward stepwise regression analyses, researchers have commonly found that illness parameters and demographic parameters have both individually and collectively accounted for relatively small proportions of variance in adjustment outcomes while coping processes have explained much larger proportions (Thompson, 1996; Thompson, Gil et al., 1993a, 1993b; Thompson, Gustafson, et al., 1992b; Thompson, Gustafson et al., 1998). Consistent with the focus of the model on adaptation processes, illness parameters have been entered into the regression models first, followed by demographics, to examine the contribution of the other components above and beyond these parameters. For example, in the study of the

influence of illness parameters, demographic parameters, maternal cognitive processes, coping methods, and social support on maternal adjustment to a child's cystic fibrosis, Thompson, Gustafson, et al. (1992b) found that neither the illness parameters nor the demographic parameters uniquely accounted for a significant proportion of variance in maternal depression but that they accounted for 13% of the variance collectively. There were significant proportions of variance explained uniquely by appraisals of the stress of daily hassles, coping methods, and family supportiveness. Collectively these variables accounted for slightly more than half of the variance in maternal depression. In terms of maternal anxiety, Thompson, Gustafson, et al. (1992b) found that the demographic parameters did not make significant unique contributions to the variance but explained 15% of the variance collectively with the illness parameter. The mothers' appraisal of daily hassles, efficacy for maintaining the child's emotional well-being, and controlled family functioning also contributed significant unique proportions of variance. Collectively these three variables accounted for 50% of the variance in maternal anxiety.

In a study of adjustment among adults with sickle cell disease, Thompson, Gil et al. (1992) also found that the illness parameters collectively accounted for only a small proportion of the variance in depression, anxiety, and GSI with only the number of complications, number of painful episodes, and type of sickle cell disease entered into the regression model. Adding the patient's gender to the regression model contributed a significant increment in explained variance in depression and overall distress but not anxiety. Overall the demographic parameters (gender, SES, and age) collectively explained less than 10% additional variance in the outcomes

with illness parameters already in the regression model. Consistent with the results of the studies on maternal adjustment (Thompson, 1996; Thompson, Gil et al., 1993a, 1993b; Thompson, Gustafson, et al., 1992b), appraisal and coping methods explained much larger proportions of variance relative to the illness and demographic parameters.

Overall the research results have provided support for the theoretical transactional model in the context of adjustment to human illness. Yet there are several limitations that may limit the validity of inferences made from the model in both the context of human illness and pet illness. The first set of limitations relates to the instruments used to measure various components of the model. There are also methodological limitations related to sampling and research design.

One of the assumptions underlying the use of measurement instruments such as the MHLC and SCL-90-R is that they measure variables on an interval or ratio scale (Elliott et al., 2006; Gehlert & Chang, 1998; Kelly et al. 2007). Although empirical analyses can reveal whether this condition is actually met, such analyses have been underutilized in comparison to the norm of accepting the assumption that the scales function as designed. As shown by Elliott et al. (2006) and Kelly et al. (2007) in their analyses of the SCL-90-R and the MHLC, respectively, the actual functioning of a rating scale based on Rasch analysis can vary considerably from the expected results produced from traditional analysis methods based on item response theory. For example, the assumption underlying typical Likert-style scales is that the interval between scale points is equal; the interval between *strongly agree* and *agree* is the same as the distance between *agree* and *disagree* in a 4-point scale or between *agree* and *neutral* in a

5-point scale (Bond & Fox, 2007; Linacre, 2004; Streiner & Norman, 2008). In reality, though, it may be much more difficult for respondents to endorse an item at a level of *strongly agree* over *agree* than it is for them to endorse *agree* over *neutral* or *disagree*, resulting in intervals that are not equidistant. In some cases there may even be an unintended disordering of intervals such that it is easier for people who have more of the latent trait to endorse a lower-level response category (such as *moderately agree*) than a higher-level response category (such as *strongly agree*), which is one of the situations that Kelly et al. identified with the MHLC scales. This type of disordering in scale categories hinders meaningful interpretation of results obtained from the instrument and consequently threatens the validity of inferences made from the results (Bond & Fox, 2007; Linacre, 2004; E. V. Smith, 2004b).

Another one of the foremost measurement-related considerations for using factor analytic methods and multiple regression techniques that have been commonly used to examine instruments such as the FES, MHLC, and SCL-90-R is the reliability of the measured variables (Stevens, 2009; Tabachnick & Fidell, 2007). Conceptually a reliability index indicates the degree to which the results of an instrument are stable, consistent, and free from measurement error (Blunch, 2008; Bond & Fox, 2001; E. V. Smith, 2004b; Wolfe & Smith, 2007b; Streiner & Norman, 2008). Mathematically, reliability is the proportion of the observed score variance that is attributable to the true score variance, with the remainder being error variance. One of the drawbacks to traditional methods of producing reliability estimates is that indices such as Kuder-Richardson rely on a single standard error of measurement for the entire sample that is based on

the average sample variance. This condition underestimates the error variance of individuals who have extreme scores in terms of the latent trait, resulting in less precise measures for the extreme scores (E. V. Smith, 2004b). These collective issues are likely contributors to some of the problems in replicating factor structures among administrations of instruments such as the FES, MHLC, and SCL-90-R.

In addition to limitations posed by instrumentation used with the transactional model, there are also methodological limitations related to research design and sampling. One of these limitations is the small sample size relative to the recommended sample-size-to-predictors ratio for multiple linear regression. There are varying guidelines about the number of cases required to produce valid and reliable regression coefficients, but recommendations generally range from 8 times the number of predictors plus a constant of 50 (Tabachnick & Fidell, 2007) to 15 participants per predictor (Stevens, 2009) depending on the desired alpha level and statistical power. In various studies on the transactional model (e.g., Thompson et al., 1998; Thompson, Gil et al., 1992), the number of participants has been far below recommendations.

    2.   **<u>FAAR</u>**

Other models of adaptation that are steeped in family systems, such as FAAR, can be especially helpful for conceptualizing the influence of factors beyond the mother-child dyad. Similar to the transactional model, the FAAR model incorporates ecological systems theory into the process of coping with stress (Patterson, 1988, 1989) but also incorporates influences within the mesosystem and exosystem. Another key difference between the models is the main unit of

analysis. Whereas the transactional model focuses within the microsystem on the coping processes and adjustment outcomes of the mother and child, the FAAR model describes how the family copes with stress as a unit.

a. Components of the model

Initially derived from the ABCX Family Crisis model and the Double ABCX model of family behavior, FAAR is a theoretical model that depicts family adjustment as a process of trying to balance the demands imposed upon the family with the family's capabilities for attaining balance (Patterson, 1988).These demands and capabilities are two key components of the FAAR model. Another key component is the set of meanings that the family draws from their experiences as they work through the stages of adjustment and adaptation.

i. Demands

Demands in the model FAAR model consist of events or conditions that change or disrupt the family system or pose a threat of disruption (Patterson, 1988). The two conditions that present demands to the family are stressors and strains. Stressors are discrete, stressful events that produce a disruptive change, whereas strains are tensions or conflicts that develop over time and require change to alleviate them. Sources of strains include tension that arose from a prior stressor but were not resolved, discrepancies in expectations for a particular role within the family, and outcomes of prior adjustment and adaptation. These types of demands may be imposed from all levels of the family's ecological system. For example, the case of a family member requiring acute medical care could represent a stressor-induced demand within

the family's microsystem. If the care requires ongoing effort to balance tenuous resources, it might also result in a strain on the family members who are attempting to rebalance the system. Similarly, restrictions imposed upon a parent by his or her place of employment, thereby limiting the amount of time the parent has available to tend to the needs of the sick child, could represent a demand as a strain within the mesosystem. Societal expectations about caring for a child with a chronic illness could represent demands imposed within the exosystem or macrosystem. While an individual demand may or may not disrupt the family's functioning, the pileup or accumulation of demands is often what disturbs the family's equilibrium.

<div align="center">

ii.   <u>**Capabilities**</u>

</div>

To restore equilibrium, the family must determine what its capabilities are for managing the demands (Patterson, 1988). The types of capabilities that the family has are resources and coping behaviors. Resources, which may be tangible or intangible, include personal characteristics of family members, characteristics of the family unit, and support provided outside of the family. The types of personal resources that family members have to meet the demands placed upon or within the family include intelligence, personality traits, health (both physical and emotional), time, mastery, and self-esteem. According to Patterson (1988, p. 216), both mastery and self-esteem are "the resources most readily threatened when the pileup of demands gets too large, particularly chronic strains that imply a failure at mastery" as these resources are instrumental in active problem solving. Three of the key family resources available for meeting demands placed upon the family are cohesion, adaptability, and

organization (Patterson, 1988). Cohesion describes the extent to which the family members function as a committed unit and support one another (Moos & Moos, 1983; Patterson, 1988). Organization refers to the extent that the family has a clear structure including roles and responsibilities among family members. Adaptability refers to how well the family can shift to accommodate changes in or upon the system (Patterson, 1988). In contrast to personal and family resources, which the family draws from within itself, the family draws community resources from external sources within its mesosystem or macrosystem (Patterson, 1988). Among the illness-related community resources that families use to meet demands are medical professionals and facilities. Social support is another important example of a community resource.

Coping behaviors in the FAAR model are specific actions taken by a family member or the family unit to manage a demand (Patterson, 1988, 1989). As in the transactional model, an individual coping strategy might involve learning how to perform a particular medical treatment or ignoring the need to perform the treatment. A family coping behavior consists of coordinated efforts among the members of the family unit undertaken to manage the demands. Examples of family coping behaviors involve reducing the number or intensity of demands upon the family, acquiring new resources or reallocating existing ones, and cognitively redefining the stressful event in terms of what it means for the family. Within the FAAR model, coping occurs in five ways: (a) taking direct actions to reduce the quantity or intensity of demands, (b) taking direct actions to get additional resources, (c) maintaining existing resources, (d) managing strains, and

(e) making the situation more manageable by changing the meaning of the situation through cognitive appraisal (Patterson, 1988).

iii.   <u>Meanings</u>

Meanings, which reflect how the family views the stressful situation, play a key role in the FAAR model (Patterson, 1988, 1989). Within the model, there are two levels of meanings: situational and global. Situational meanings reflect the way that the family defines their demands and their capabilities for acting upon a stressful situation based on their previous experience. In defining the situation, the family considers a variety of factors including how controllable the situation appears and how much change it will likely require. This definition also includes an evaluative component as the family considers what capabilities it has in terms of available resources and coping behaviors. In situations where the perceived demands exceed the perceived capabilities, tension arises within the family unit, resulting in additional stresses and strains. Tension also surfaces when there are ambiguous or conflicting definitions among family members, especially when these conflicts remain unresolved.

Two key types of ambiguity in the context of the FAAR are social ambiguity and boundary ambiguity (Patterson, 1988). Social ambiguity occurs when there are no established guidelines for the appropriate response to the stressful situation. This condition may arise when established conventions no longer seem applicable or effective in dealing with a situation. The novelty of a stressful situation may also present social ambiguity. Boundary ambiguity, which concerns the figurative boundaries of the family unit, occurs as family members contend with

shifts in their roles within the family or with incongruity between the physical, cognitive, or emotional absence of individuals who are traditionally considered part of the family's core unit. An example of such an absence is a parent living outside of the child's home due to divorce or prolonged hospitalization or institutionalization. An example of a role shift is a son or daughter functioning in a parental capacity to care for an aging or cognitively impaired parent. With social and boundary ambiguity, the resultant tension produces a strain on the family unit especially when family members ascribe discrepant meanings to the situation. In some cases, social support may help alleviate the tension by reducing the ambiguity of the situation as the entity providing the support affirms the family members' responses or provides feedback.

Global meanings make up the family's schema for how the members relate to one another and to the larger community (Patterson, 1988). This schema includes the family's sense of shared purpose and their assumptions about the boundaries of the family. In some cases a family may define itself based on birth, thereby considering all close relatives to be part of the family's microsystem regardless of whether the family members actually live together. In other cases a family might define itself in terms of the members living within the same household. When boundary ambiguity exists among the family members, as well as when there are differing views of the relative primacy of certain bonds (such as the parent-child or husband-wife bond), it produces additional stress and strain.

Adjustment and adaptation in the context of the FAAR model, occur in two stages separated by a crisis (Patterson, 1988). In the adjustment stage, the family functioning is

relatively stable and predictable. Changes may occur within the family in this stage but are relatively minor, and the family is able to balance the demands placed upon it with its capabilities. The family's response to new demands in this stage typically consists of avoidance, elimination, or assimilation. Avoiding the demand in the context of FAAR means ignoring the demand or denying that it exists, which enables the family to maintain its functioning. Maintaining the family functioning without change is also the intent of the elimination response. In assimilation, the family accepts the demand and incorporates it into the family structure albeit "with only minor changes" (Patterson, 1988, p. 227).

When the demands placed upon the family exceed it capabilities, it enters the crisis stage with the level of crisis depending on the extent of the disruption to the family's functioning (Patterson, 1988). From this crisis the family either recovers by enacting major changes or dissolves itself. The process in which the changes occur is the adaptation stage. In this stage the family attempts to restore balance and minimize the discrepancy between its demands and capabilities by redefining the situation, reducing the demands, acquiring new adaptive resources, or developing new strategies for managing the demands. In some cases the family may also redefine the roles of its members to reallocate or redefine the demands.

b.   **Measurement and research with the FAAR model**

Compared to the transactional model, research applying the FAAR model as a theoretical framework has been less consistent in terms of measures and approaches. Several studies using the FAAR model have utilized qualitative methods to investigate the outcomes and process of

adaptation among families dealing with a member's chronic illness, injury, or disability. Examples of these qualitative studies include an investigation of adaptation among married couples in which a spouse had recently undergone coronary bypass surgery or angioplasty to treat coronary artery disease (Patterson, 1989). In this study the researchers used grounded theory methodology to examine the patients' beliefs about the cause of their conditions, the person who was responsible for the major changes in their lifestyle following the treatment, and the ways in which the patients redefined their situations following the treatment.

Quantitative studies using the FAAR model as a theoretical foundation have included an investigation of adaptation to brain injury (Carnes & Quinn, 2005) and an investigation of couple's adaptation to a variety of chronic illnesses among their children (Berge et al., 2006). In the study of adaptation to brain injury, Carnes and Quinn (2005) utilized hierarchical linear modeling to examine how various factors, including the family's resources, coping, and perceptions, pile-ups of stressors, the relationships between the patient and caregiver, and neurolobehavioral sequelae affected the family's adaptation to a brain injury sustained by one of its members. The outcome variable used to represent the family's level of functioning was the global score obtained from the Brief Symptom Inventory (BSI). Similar to the SCL-90-R, the BSI measures nine dimensions of psychological health and well being, but the latter instrument contains only 53 items.

To measure family functioning and relationship quality, Carnes and Quinn (2005) used the Family Adaptation, Partnership, Growth, Affection, and Resolve (APGAR) scale and the

affectional solidarity scales of the Intergenerational Solidarity Scale, respectively. The other

measures of family resources in Carnes and Quinn's study primarily came from scales of the

Family Crisis Oriented Personal Evaluation Scale (F-COPES). Developed from literature and

research on family stress theory, the F-COPES indicates how families cope with stressful

situations among several dimensions related to support, meaning making, and appraisal

(McCubbin, Olson, & Larsen, 1981). Two measures of family resources that Carnes and Quinn

(2005) incorporated in the study were financial security and concerns about insurance coverage.

A Likert-style item provided the measure of financial security, and a dichotomously-scored item

indicated the presence or absence of concerns about insurance coverage.

Carnes and Quinn (2005) found a positive correlation between financial security and

psychological distress among individuals who were the primary caregiver for a spouse with a

traumatic brain injury. The reason for the positive correlation was that a lower score on financial

security indicated higher security. Caregivers who had concerns about their insurance coverage

had significantly higher levels of distress relative to caregivers who did not have concerns about

their insurance coverage. There was also a significant difference in terms of family functioning

based on the presence or absence of concerns about insurance.

When examined using a mixed linear model with scores for financial security, insurance

concerns, and behavior at Level 1 of the model, level of cognitive functioning at Level 2, and

BSI scores as the dependent variable, Carnes and Quinn (2005) found that financial security was

the second strongest predictor of psychological distress. The strongest predictor in the model

was the behavior score based on a research-based behavioral checklist. Concerns about insurance was not a significant predictor of psychological distress. Collectively the four variables accounted for 83% of the variance in the BSI scores. When examined using another mixed linear model with the scores for financial security, social support, and premorbid relationship quality at Level 1 and APGAR scores as the dependent variable, Carnes and Quinn found that financial security was the second strongest predictor of family functioning. Social support was the strongest predictor in the model, and premorbid relationship quality was also a significant predictor. Collectively the variables accounted for 75% of the variance in family functioning.

Although Carnes and Quinn (2005) did not report the range of financial security or SES or levels represented by the participants in the study, the results of their analyses suggest that the financial variable could have implications for both the transactional model and the model of caregiver adjustment. For example, there may generally be a positive relationship between SES and financial resources, but having a high SES does not necessarily mean that a family has a high disposal income or has no concerns about their finances (Duncan & Magnuson, 2003). Examining an individual or family's level of financial concerns rather than SES may provide increased power for predicting psychological distress among family members coping with chronic illness or understanding why there may be a negative relationship between SES and anxiety among parents and other adults dealing with chronic illnesses such as diabetes (Seiffge-Krenke, 2001).

Other aspects of psychological distress that researchers have studied using the FAAR model relate to marital conditions. Berge et al. (2006) used SEM to examine how the relationships among the components of the FAAR model applied to married couples adapting to their child's chronic health condition. The illnesses and conditions represented in the sample included neurological, cardiac, pulmonary, maxillofacial, gastroenterologic, urologic, and orthopedic impairments as well as developmental disabilities. The measurement model consisted of four observed factors (depressive symptoms and marital satisfaction at two time points) and two latent constructs (the severity of the child's condition and the parents' perceptions of the negative impact of the condition). In the study, Berge et al. (2006) assessed the overall fit of variations of the FAAR model separately for mothers and fathers. Of the three alternative models that the researchers tested (a direct effects model of severity, a direct effects model of depressive symptoms and satisfaction, and a fully recursive model), the direct effects model of severity provided a better fit for the mothers' data, and the direct effects model of depressive symptoms and satisfaction provided a better fit for the fathers' data. The direct effects model, in which there was a direct path from the severity of the illness to both depressive symptoms and marital satisfaction at the second time point, produced a significantly lower goodness of fit index for the mothers relative to the theoretical model. In the direct effects model of depressive symptoms and satisfaction, which provided a better fit for the fathers' data, there was a direct path from depressive symptoms at the initial time point to marital satisfaction at the final time point and from marital satisfaction at Time 1 to depressive symptoms at the final time point.

The results of the study by Berge et al. (2006) suggest that the severity of illness can have a significant impact on the mother's depressive symptoms, which contrasts with the relatively low proportions of variance in depressive symptoms explained by illness severity in the transactional model (Thompson, 1996). The results also indicate that the severity of the illness can have a significant effect on the mothers' marital satisfaction. Both fathers and mothers showed decreased marital satisfaction over time, while the factors directly contributing to this decrease were slightly different. For mothers, perceptions of the negative impact of the illness influenced the change in marital satisfaction, but this influence was not present for fathers. Marital satisfaction at the initial time point, though, was a significant contributor to the decrease in marital satisfaction for both mothers and fathers. These results also underscore the need to consider caregiver gender in models of adjustment.

C. __Proposed Model of Caregiver Adjustment__

Common to the FAAR model and transactional model are a variety of illness-related, intrapersonal, interpersonal, and environmental influences on adjustment to chronic illness. Applying an ecological systems perspective, the models aid understanding of not only how a person with a chronic illness adjusts to it but also how conditions in the person's environment and other systems influence this adjustment. These models also provide a useful framework for theorizing about how people adapt to the chronic illness of their pets, given that pets are often integral members of the family system (Cain, 1985, 1991; Carmack, 1985; Gage & Holcomb, 1991; Margolies, 1999; Turner, 2001; Veevers, 1985). Specifically the transactional model and

the FAAR model provide insight into how various sources of stress, as well as the family context, can mediate the caregiver's appraisal of the illness and his or her ability to draw from a variety of resources to manage it. The FAAR model also provides a useful framework for understanding how societal norms related to the social position of pets contribute to the caregiver's stress and coping mechanisms, which affect his or her adjustment.

Informed by these models, the noncategorical model proposed for describing how caregivers adjust to the chronic illness of a pet consists of seven main components (refer to Figure 1): personal factors, illness factors, social-environmental factors, cognitive appraisal, coping processes, adjustment, and time. The first three factors (personal factors, illness factors, and social-environmental factors) represent antecedents within Lazarus and Folkman's (1984) framework and the FAAR model (Patterson, 1988). Antecedents are the background onto which the illness occurs and are factors that directly and indirectly influence the individual's selection of coping strategies. Consistent with the transactional model, coping processes consist of how a person cognitively appraises the illness and how he or she responds to it (Patterson, 1988; Thompson & Gustafson, 1996). Adjustment in the proposed model is treated as an outcome of the individual's selected coping strategies. As considered by Moos and Schaefer (1984) and others (Stanton et al., 2001, Thompson & Gustafson, 1996; Wallander & Thompson, 1995), adjustment also functions as in input into the coping processes, as the individual may alter his or her means of coping in response to the effectiveness or ineffectiveness of a particular coping effort. Hence, the model represents a feedback loop although Figure 1 does not depict this path.
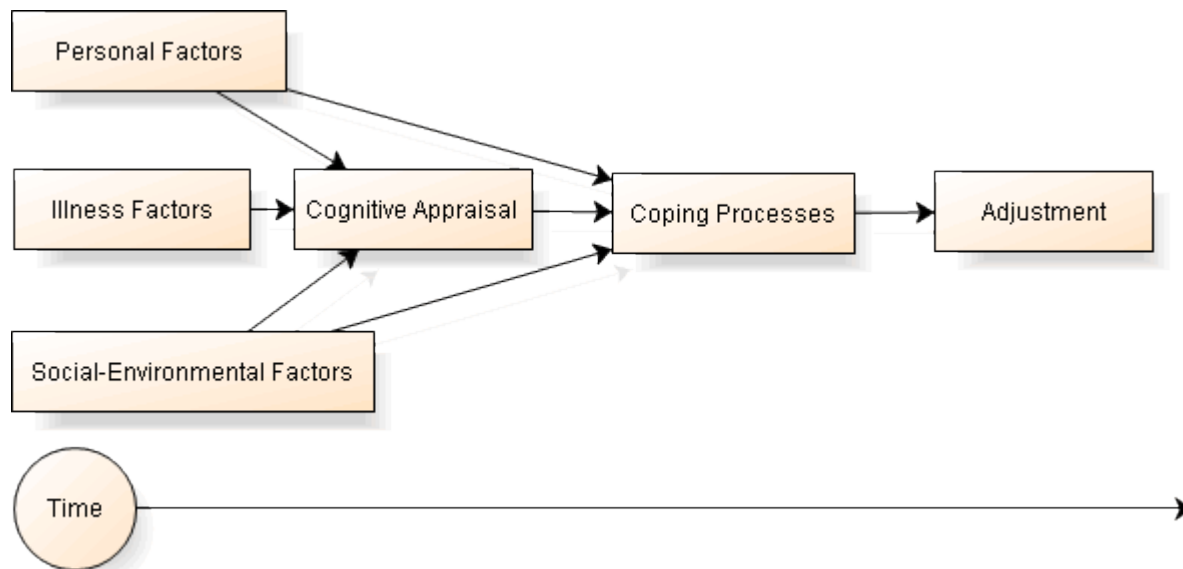
Figure 1. Conceptual model of caregiver adjustment to a pet's chronic illness.

1.   <u>Illness factors</u>

Consistent with the transactional model of stress and coping (Thompson et al., 1992a, 1992b), illness factors are characteristics and conditions that directly relate to the illness or its treatment and have a direct influence on an individual's appraisal of the illness and his or her adaptation. Unlike the transactional model, though, in which illness severity is the main illness parameter, the proposed noncategorical model incorporates a range of illness factors for cross-

illness comparisons. The generic illness factors included in the proposed model are illness type and illness course.

Illness type refers to the main type of illness that the pet has (such as diabetes, epilepsy, chronic fatigue, etc.). In veterinary medical literature, both acute and chronic illnesses are typically classified by organ or body system. Examples include metabolism, skin, and nervous system (Kahn, 2007). In the context of the proposed model, illness type provides a means of comparing illnesses in terms of the affected organ systems and bodily functions.

The basis for the illness course in the proposed model is Rolland's (1984, 1987) typology of chronic illness. Within the typology, illness course refers to the overall progression of symptoms in terms of whether they are progressive, constant, and relapsing/episodic. These levels are also applicable in the context of veterinary illness. For example, relapsing illnesses may produce greater strain on the caregiver relative to constant-course illnesses due to the uncertainty of when a medical episode will occur. For illnesses such as epilepsy, in which episodes may occur periodically and unpredictably even when the overall condition is controlled (Lord & Podell, 1999), caregivers may experience even greater stress from worrying about when the next seizure will occur. For potentially constant-course illnesses such as diabetes in which the pet's glycemic index is relatively stable, the associated stresses may be lower in spite of the potential for life-threatening conditions such as hypoglycemia (Fleeman & Rand, 2001), because there are ways of anticipating and preventing the conditions.

2.   __Personal factors__

Consistent with the transactional model, demographic factors in the proposed model may have a direct influence on the caregiver's appraisal of the pet's illness. Demographic factors may also influence the caregiver's selection of coping strategies. Unlike the transactional model, though, the personal factors focus on the caregiver's gender and financial concerns rather than a direct measure of SES.

Unlike many variants of the transactional model, which have focused on maternal adjustment to a child's chronic illness (Thompson & Gustafson, 1996; Thompson et al., 1998; Wallander & Thompson, 1995), the proposed model incorporates potential gender differences among caregivers in terms of coping processes and adjustment. The main bases for including caregiver gender as an input to cognitive appraisal and coping strategies are the shortage of studies that have systematically examined gender differences among mothers and fathers who are the primary caregiver for a child with a chronic illness and empirical evidence that mothers and fathers differ in terms of perceptions of the family climate (Loveland-Cherry et al., 1989), coping processes, and adjustment outcomes (Berge & Patterson, 2004; Berge et al., 2006). Factors that have contributed to the shortage of analyses focused on gender differences among caregivers include the prevalence of mothers as the primary caregivers of children with chronic illnesses (Coffey, 2006; Thompson & Gustafson, 1996) and an insufficient number of fathers included in samples to support statistical analysis (Thompson et al., 1992b; Wong & Heriot, 2008). The latter case has specifically been an issue in studies conducted on the transactional model whereby

fathers were included in the sample but whose data were either removed from the data or aggregated with the mothers' data because there were not enough fathers to permit statistical analysis of gender differences (Thompson et al, 1992b). This issue may also be relevant for the proposed model based on evidence of the prevalence of females who assume primary care for a pet (AVMA, 2007).

In studies where researchers have examined caregiver gender as an influence on adjustment, systematic differences have been found in terms of both coping strategies and outcomes. For example, Seiffge-Krenke (2001) reported that mothers of adolescents with diabetes generally had higher total F-COPES scores than fathers had and that there were differences in the score decreases that occurred over time for mothers relative to fathers. From a FAAR-based longitudinal study of parents of children who had various chronic illnesses, Berge et al. (2006) found significantly higher levels of depression among the mothers than among the fathers at both the initial and final data collection. In terms of their perceptions of both social strain and role strain in their families, the mothers also showed significantly higher levels than did the fathers at the initial data collection. There were also differences in the relationships between initial social strain and depression among the mothers and fathers. Projecting these results onto the context of veterinary illness suggests that male caregivers may show systematic differences from female caregivers in terms of adjustment outcomes.

Unlike the transactional model, the proposed model of caregiver adjustment does not include a composite measure of SES but does address financial concerns. Although including

SES could potentially explain more variance in adjustment, research on the transactional model

has generally shown that SES does not have a statistically significant influence on adjustment

outcomes. For example, Thompson, Gustafson, et al. (1992b) found that good versus poor

maternal adjustment to a child's cystic fibrosis did not vary based on SES and that SES did not

account for a significant proportion of variance in depression or anxiety among the mothers.

Illness parameters and SES accounted for 12% of the variance in maternal depression and 11%

of the variance in anxiety with only these two predictors entered in the regression model. Using

similar analyses, Thompson, Gil, et al. (1992) found smaller cumulative proportions of variance

in depression symptoms, anxiety, and GSI scores explained by illness factors, patient gender, and

SES among adults managing sickle cell disease. The addition of SES in the regression model did

not produce a significant change in R^2 for any of the adjustment outcomes. There were no

significant differences between the patients who exhibited good-adjustment and the patients who

exhibited poor adjustment in terms of GSI scores based on contrast comparisons of

Hollingshead's SES levels. From other research on adjustment to chronic illness, though, there

has been a relationship between SES and adjustment outcomes among fathers. For example, in a

study of posttraumatic stress symptoms (PTSD) among parents of children who had survived

cancer or had been diagnosed with diabetes, Fuemmeler, Mullins, Van Pelt, Carpentier, and

Parkhurst (2005) found that SES as measured by Hollingshead's four-factor index was a

significant contributor to the variance in PTSD symptoms as measured by the Posttraumatic

Stress Diagnostic Scale and psychological distress as measured by GSI scores from the BSI. In

the hierarchical regression model in which the number of months since the illness diagnosis was entered first, followed by the parent's age in years and SES (entered at the same step), the variables collectively accounted for 14% of the variance in PTSD symptoms.

Given the potential for SES-related factors to influence a caregiver's ability to afford medical care for the pet, it seems reasonable that concerns about treatment costs could influence a caregivers' psychological adjustment, especially if he or she has limited financial resources and lacks insurance to cover veterinary costs. As with illness in the human context, managing a chronic illness in the veterinary context can mean considerable costs (Chang et al., 2006; Lord & Podell, 1999; Neuvians & Berger, 2002) and is assumed to be one of the key factors in treatment compliance (AAHA, 2009). For example, managing Type II diabetes often requires the procurement of insulin, insulin syringes, glucose monitoring devices, and in some cases a prescription diet (Neuvians & Berger, 2002). While veterinary insurance may cover a substantial portion of the costs, the caregiver still bears financial responsibility for the care. The greater the financial demands that the illness imposes on caregiver's resources are, the greater the potential is for finance-related stresses to develop. Studies of health-related quality of life have indicated that cost may be of little concern to people caring for an ill pet relative to the pet's quality of life (AAHA, 2009; Bowles et al., 2010; Chang et al., 2006), but the conditions under which this statement might hold need to be explicated.

To examine the salience of the potential financial toll if the illness, the proposed model includes a *financial concerns* component. As in the case of the FAAR model (Patterson, 1988,

1989) and the study conducted by Carnes and Quinn (2005), the caregiver's level of concern

about his or her finances is of interest as a potential resource for managing the illness.

Theoretically caregivers who have greater concerns would appraise the financial demands of the

illness as substantially more taxing relative to caregivers who have lesser concerns. This

component allows for the exploration of SES-related issues while overcoming several of the

limitations of using composite measures of SES and the challenges of disaggregating it into

occupation, education, and income. For example, the limitations include potential gender bias

among rankings of occupations and broad heterogeneity in education and income within the

resultant SES levels. The challenges include the lack of reporting that is common with

questionnaire items that solicit income information (Duncan & Magnuson, 2003; Haug, 1977;

Hauser & Warren, 1997).

3.   <u>**Social-environmental factors**</u>

Whereas the personal factors in the proposed model focus on intrapersonal attributes, the

social-environmental factors in the model focus on cognitive appraisal and interpersonal

interactions between the caregiver and agents within his or her mesosystem. These agents

include the caregiver's family members and other people who can potentially provide social or

emotional support. Also included are intangible agents such as the everyday stresses that the

caregiver confronts which may exacerbate the psychological toll of the illness (Lazarus &

Folkman, 1984). Depending on the context in which they operate, these agents may function as

resources to alleviate stress or as added sources of stress (Patterson, 1988).

a.   Cognitive appraisal

Consistent with both the transactional model and the FAAR model, cognitive appraisal is an integral component of the proposed coping process. Rather than focusing on the caregiver's appraisal of the stressfulness of the collective illness tasks as in the transactional model, though, the proposed model also draws from the distinction made by Lazarus and Folkman (1984) between primary and secondary appraisal, with an emphasis on primary appraisal. During this process, the caregiver would appraise the level of threat and challenge associated with the illness based on his or her beliefs about being able to control the illness. Threat refers to the caregiver's perceptions or expectations for harm or loss associated with the illness. In contrast, challenge refers to the caregiver's perceptions of his or her ability to master the demands of the illness and the potential for gains or mastery. Threat typically has negative connotations and involves emotions such as fear and anger, whereas challenge often has positive connotations. These constructs are not mutually exclusive, however, as a caregiver may ascertain that the illness poses both a threat and challenge and may then direct resources to address each condition. Hence, it is of interest how caregivers appraise aspects of the illness in terms of threat and challenge and what caregivers believe that they can do about the appraisal.

b.   Locus of control

Similar to the transactional model (Thompson et al., 1993; Thompson, Gil, Gustafson, George, Keith, Spock, & Kinney, 1994), the proposed model also includes illness locus of control as an expectancy component. In the context of veterinary illness, efficacy expectancy

would be the caregiver's beliefs that he or she could successfully manage the illness. The

caregiver's locus of control would be his or her beliefs about the nature of entity that has the

most control over his or her pet's condition. A caregiver who has an internal locus would tend to

attribute the pet's condition to his or her own actions rather than the actions of others such as a

veterinary professionals, chance, or fate. In contrast, caregivers with a locus towards powerful

others would tend to attribute their pet's health outcomes to others such as veterinary

professionals. Caregivers who have a chance orientation would tend to attribute their pet's

health outcomes to fate or chance.

c. <u>Social support</u>

While family members can function as a source of social support that promotes positive

adjustment, they can also present additional sources of stress or strain that increases the

caregiver's susceptibility to maladjustment (Patterson, 1988; Thompson, Gil, et al, 1992a, 1992b;

Thompson, Gil et al., 1994). In the transactional model, this influence is in terms of the

supportiveness, conflict, and control within the family (Thompson, 1985; Thompson &

Gustafson, 1996; Wallander & Thompson, 1995). These factors are also of interest in the

proposed model as potential moderators of the caregiver's adjustment. However, the proposed

models incorporates these factors as only one aspect of social support and extends beyond the

boundaries of the family's microsystem. Anecdotal evidence suggests that caregivers may

receive all types of support from a variety of members of their microsystems, mesosystems, and

exosystems. For example, a spouse or other intimate partner might provide emotional support to

the caregiver by expressing genuine concern about the pet's well-being. A friend, coworker, or neighbor could provide similar support. Likewise, an individual in the caregiver's mesosystem might also provide informational support by sharing his or her experiences in dealing with a similar illness.

In addition to these aspects of community resources and family functioning that contribute to social support, the proposed model incorporates the role of boundary ambiguity in caregiver adjustment. The influence of boundary ambiguity on caregiver adjustment may be even more pronounced when the members of the caregiver's microsystem or mesosystem ascribe differential member status to the pet. In the literature on grieving for the loss of a pet, this issue often surfaces as caregivers contend with sentiments such as "he was *just* [emphasis added] a dog" (Toray, 2004, p. 247). Dealing with these types of expressions exacerbates the caregiver's grief as he or she copes with the loss of what the person views as a family member (Carmack, 1985; Toray, 2004). Even within families where the pet has family status, there may still be differential perceptions of the stressfulness of a pet's loss. For example, from data collected via questionnaires from a large sample of husband and wife couples who had experienced pet loss, Gage and Holcomb (1991) found consensus among less than half of the couples in terms of the stressfulness of the pet's loss.

These types of issues would also be likely to present a strain in the context of caring for a pet with a chronic illness. For example, a caregiver may be stigmatized by family members or coworkers because he or she is spending an unexpectedly high amount of resources in managing

the pet's illness. Just as a husband or wife may feel neglected as his or her spouse spends most

of the day attending to the needs of a chronically ill child (Berge & Patterson, 2004; Berge et al.,

2006), the husband or wife may feel even more resentment that he or she must take a figurative

backseat to the pet. Consequently, this resentment may have a negative impact on the couple's

marital satisfaction, as shown in research on parents of children with a chronic illness (Berge &

Patterson, 2004; Berge et al., 2006). Hence, a misalignment between the boundaries of the

family as perceived by the caregiver and the boundaries as perceived by his or her spouse or

familial partner, coupled with a differential sense of responsibility to the chronically ill pet, could

have a negative impact on aspects of the caregiver's adjustment. Congruence between the family

status of the pet ascribed by the caregiver and the status ascribed by other people within the

caregiver's microsystem and mesosystems is a proxy for social support that facilitates the

caregiver's coping process. The assumption is that a stronger view held by others that the pet is

a family member or close companion would provide potentially greater social support for the

caregiver.

4.   **Coping methods**

One of the effects of the appraisal process in the proposed model is the use of particular

coping strategies. Consistent with the transactional model, the prevalence of both palliative and

adaptive coping strategies is of interest in the proposed model. The types of actions taken by the

caregiver to accomplish the same balance sought by the family system as described by the FAAR

model (Patterson, 1988) are also of interest. These actions include reducing the number or

intensity of the demands upon the caregiver, acquiring new resources or reallocating existing ones, managing strains, and redefining the meaning of the illness. Rather than using the schema of emotion- and problem-focused coping methods used in the transactional model, though, the proposed model focuses on families of coping methods as proposed by Skinner et al. (2003), which are better suited to represent the multidimensional nature of coping methods. The system used with the proposed model is based on the work of Tobin (1982) and Tobin, Holroyd, Reynolds, and Wigal (1989). Within this hierarchical system, there are three levels of coping (Tobin et al., 1989). At the primary level are individual coping strategies among six scales: problem solving, cognitive restructuring, express emotions, social support, problem avoidance, wishful thinking, self-criticism, and social withdrawal. The second level consists of four factors that distinguish between coping strategies in terms of whether they are problem focused or emotion focused and whether they reflect engagement or disengagement. For example, problem engagement reflects the use of strategies such as cognitive restructuring and problem solving to manage the situation. Problem disengagement reflects the use of strategies to avoid the situation, which includes wishful thinking and problem avoidance. In contrast, emotion engagement represents the use of strategies such as expressing emotions and seeking social support, which involve actively conveying emotions. The distinction between managing and avoiding the stressful situation also forms the basis for the third level of factors: engagement versus disengagement. Whereas engagement suggests that the person is actively confronting the

situation cognitively and emotionally, disengagement reflects a tendency to avoid thoughts or actions that could potentially after the stressful situation.

5. Adjustment

Similar to the transactional model, symptoms of psychological distress among caregivers are outcomes of the adjustment process in the proposed model. The outcomes that are of primary interest are depression and anxiety. Depression in this context, which is based on the SCL-90-R, refers to a state in which the person exhibits a sense of hopelessness and lacks motivation, energy, and interest in his or her regular activities (Derogatis, 1994; Derogatis et al., 1973; Derogatis & Wise, 1989). Anxiety represents an uncomfortable or unpleasant feeling in response to an expected event. Both of these constructs also contribute to global distress, which also includes symptoms of hostility, interpersonal sensitivity, obsessive-compulsive, phobic anxiety, paranoid ideation, psychoticism, and somatization.

6. Time

Time plays a role in the proposed model in recognition that the duration of the illness may influence all of the components of the model except for demographic parameters, which are presumed to be stable. As reflected in the literature on adjustment to chronic illness among people, adjustment outcomes and the processes leading up to them are not static entities (Berge & Patterson, 2004; Herbert & Cohen, 1996; La Greca & Schuman, 1995; Leventhal et al., 2004; Moos & Schaefer, 1984; Patterson, 1988, 1989; Rolland, 1984; Seiffge-Krenke, 2001; Stanton et al, 2001; Thompson, Gil et al., 1994; Thompson & Gustafson, 1996). Changes in the illness

parameters as well as feedback provided internally and externally about the effectiveness of appraisals and coping strategies can occur over time and change the way that an individual and his or her family responds. For example, a change in the symptoms or severity of an illness may precipitate a change in treatment regimen which may place additional demands upon the caregiver. Depending on resources available to the caregiver when the change occurs, the caregiver may need to adapt his or her coping to maintain a balance between the demands and resources or experiences additional stresses.

D. **Discussion**

The proposed model represents a conceptual projection of the stresses and coping processes associated with managing a person's chronic illness onto the context of managing a pet's chronic illness. One of the main assumptions underlying the proposed model is that adjustment to the pet's illness shares several characteristics with a person's adjustment to the chronic illness of another family member. Support for this premise is based on literature documenting the role of pets as family members (Cain, 1985; Carmack, 1985; Margolies, 1999; Sharkin & Knox, 2003; Turner, 2001; Veevers, 1985) and the similarities of illnesses and treatments that afflict both pets and people (Cerquetella et al., 2010; Chang et al., 2006; Favrot et al., 2010; Fleeman & Rand, 2001; Marsella & Olivry, 2003; Neuvians & Berger, 2002; Rock & Babinec, 2008; Tarello, 2001).

Drawing from models of psychosocial adjustment to human illness informs the conceptualization of adjustment to similar illnesses in the pet context much like research in the

field of human medicine has informed the treatment of these illnesses in veterinary medicine (Cerquetella et al., 2010; Favrot et al., 2010; Neuvians & Berger, 2002). Similarly, attention to measurement issues related to the models can also strengthen efforts to understand the relationships among the wide range of factors that influence adjustment. Examining the personal, social-environmental, and cognitive factors in the proposed model of adjustment was the focus of the present study. The aim of the first research question, pertaining to caregiver demographics, was to provide insight into how the factors in the model associated with caregiver characteristics. The aim of the other two research questions was to provide insight into how the factors contributed to caregiver adjustment and how well the overall model accounted for the adjustment outcomes.

III.   METHODS

The study utilized a cross-sectional design entailing the collection of self-report questionnaires and a multimethod quantitative approach to data analysis. Applying Morse's (2003) distinction between multimethod designs in terms of whether the main theoretical drive is inductive (qualitative) or deductive (quantitative) and the methods are conducted simultaneously or sequentially, the study represented a ($QUAN_{Rasch} \rightarrow QUAN_{SEM}$) design. The uppercase QUANs denote the primary quantitative components (Rasch analysis and SEM, respectively), and the arrow denotes the sequencing. The primary role of Rasch analysis was to refine and optimize the measures used for testing the empirical model of caregiver adjustment. The SEM component provided a means of testing how well the variables in the empirical model accounted for the variances and covariances in the adjustment outcomes, which addressed the third research question. This component also addressed the research question that focused on identifying the personal, social-environmental, and cognitive factors that contributed to the caregiver's psychosocial adjustment. Thus, the collective research design provided a means of statistically testing and refining the model of caregiver adjustment as well suggesting potential modifications for future inquiry.

A.   Participant Recruitment

The target population for the study consisted of adults who were voluntarily managing the health and well being of a pet with a chronic illness or disease. Use of the term *voluntarily* was meant to exclude veterinary health care professionals and others who provided care as a

condition of paid or otherwise compensated employment. The target demographics for caregivers were a minimum age of 18 years and residency in the United States. The reason for the age criterion was to filter out participants who were not likely to have financial responsibility for the pet's veterinary care, which was one aspect of caregiving. The intent of the geographical focus was to minimize potential confounds due to differing societal views of pets within versus outside of the United States. Another criterion used for sampling potential participants was the recency of the illness. The intent was to focus on caregivers who had been actively managing their pet's illness for at least 3 months. While the number of months was somewhat arbitrary, the main basis for this criterion was a projection informed by the FAAR model. The implication was that caregivers who had recently received the diagnosis would likely be in a stage of crisis rather than adaptation (Patterson, 1988).

There were two main methods used to convey the sampling criteria and recruit prospective participants: print-based flyers posted in veterinary medical facilities and discussion postings submitted to Internet-based social networking sites. The bulk of the flyers were distributed via postal mail to over 1200 veterinary facilities throughout Illinois, Indiana, Wisconsin, and five counties in Pennsylvania. An electronic version of the flyer was also posted on the website set up for the study. Examples of Internet sites used to post recruitment notices included K9 Diabetes.com and Diabetic Cat Care. While these specific sites focused on diabetes, there were also other sites dedicated to the care of pets with other illnesses. The original aim of this recruitment method was to reach a much broader range of the target

population than the postal mailings, but site-imposed restrictions on advertisements suppressed this recruitment method to fewer than 10 sites.

Upon reading the recruitment materials, prospective participants had the option of reviewing the consent information and completing the questionnaire online via SurveyMonkey or requesting to receive the materials in paper format via postal mail. There was no compensation available to participants for participating in the study, but there was a recruitment incentive in the form of 10 drawings for a $100 giftcard for a pet supply store of the winner's choice (to be awarded at the end of the study). The participants who completed the electronic questionnaires had the option to enter their contact information for the drawings via a link presented at the end of the questionnaires. The participants who completed the paper-based questionnaires had the option to enter the drawings by completing a separate entry form that was included in the packet. Aside from the contact information needed to enter the drawings, the participants completed the questionnaires anonymously. To preserve the anonymity of the electronic data, there were separate repositories for the questionnaire responses and the drawing entries. To maintain anonymity of the mailed responses, there were separate envelopes for returning the questionnaire and the drawing entry, with the researcher's address listed as both the sender and recipient.

B.   Data Collection

The caregivers were the sole data sources utilized in the study. Although it would have been desirable to have the pet's primary veterinarian provide information about the illness

context, the logistics of collecting this information across a multitude of number veterinary facilities would have rendered data collection too unwieldy. The set of data collection instruments is shown in the Appendix. Each section of the instrument yielded data for a set of variables corresponding to a component in the conceptual model (refer to Figure 1). These variables represented illness factors, personal factors, cognitive appraisal, health locus of control, family functioning, social support, and psychological adjustment. Coping methods were not part of the instrument used in the present study, primarily to focus the study on the antecedents to the coping process and to minimize the response load on the participants.

Existing instruments and new instruments derived from previous research on the transactional model were the primary means used to measure the variables. With the exception of some of the variables that targeted illness parameters and demographics, all items used polytomous scoring on an ordinal or interval scale. Consistent with recommendations made by Netemeyer, Bearden, and Sharma (2003), Streiner and Norman (2008), and Wolfe and Smith (2007a) for questionnaire design, all points of the corresponding rating scales had an accompanying label. Most of the scales utilized an even number of response categories to compel the respondents to select a non-neutral response. Consistent with practices used in Rasch modeling, the general scoring model reflected that the highest response category and index in the scales coincided with the highest level of the construct being measured (Linacre, 2004). In cases where items in existing instruments did not follow this scoring model, such as items that used negative phrasing, reverse coding of the item responses preceded the statistical analyses.

1.   <u>Illness factors</u>

The Pet Illness Context questionnaire (refer to the Appendix) was the segment of the questionnaire used to collect information about the illness factors and the pet's illness. This information included the type of pet, the type of illness, the length of the illness, the course of the illness, and a description of the treatment regimen. For both the type of pet and type of illness, the caregiver could select from a list of predefined options or enter an open-ended response. In anticipation of potential comorbidity of illnesses, the item for illness type directed the caregiver to identify the pet's *primary* illness. In cases where the caregiver entered multiple illnesses in the *other* box, the primary illness was the one that the caregiver listed first. For the item that targeted the course of the illness, the response categories were derived from the courses defined by Rolland (1984): progressive, constant, and relapsing or episodic. Rather than using the levels as labels, though, the response categories contained a definition to help encourage consistent usage of the response categories across respondents (Streiner, 2008). For example, the definition presented for the progressive category was "The symptoms of your pet's illness are getting progressively worse or more severe." There was also an *other* response category to enable respondents to identify illness courses that did not fit the three predefined courses. Through content analysis, these entries underwent recoding to assimilate them into the original schema. For the length of the illness, the caregiver entered the number of years and months that had elapsed since the diagnosis of the illness. These values were then converted to a total number of months for the corresponding variable in the analyses. There was also an open-ended item on

the instrument to explore what it meant to the caregiver to care for a pet that has a chronic illness. The purpose of this item was to elicit data for the research question focused on the meaning of the caregiver's experience of managing the illness, primarily for follow-up research.

2.   **Personal factors**

The Pet Caregiver Demographic Questionnaire (shown in the Appendix) was the segment of the questionnaire used to elicit demographic and background information about the caregiver. The requested information included the caregiver's gender, age, education, marital status, and whether there were children living in the caregiver's household. With the exception of the questions that elicited the caregivers' education and age, all of these demographic items were close-ended and produced dichotomous variables. The question about education was also close ended but had more than two response categories; the question about the caregiver's age was an open-ended item. There were also questions that asked whether the caregiver had veterinary insurance and financial concerns. The question about veterinary insurance, which asked whether the caregiver had insurance that covered at least part of the cost of the pet's medical care, produced a dichotomous categorical variable. The question about financial concerns measured the caregiver's concerns about being able to pay for the pet's medical care. The anchors for the 3-point response scale for this polytomously scored item were *no concerns* and *major concerns*, with the latter response category corresponding to the highest response value.

3.   <u>**Cognitive appraisal**</u>

The Cognitive Appraisal of Pet Illness questionnaire (shown in the Appendix) was the

segment of the questionnaire used to measure the caregiver's appraisal of the illness. Derived

from the Stress Appraisal Measure (SAM) developed by Peacock and Wong (1990) and the

analysis conducted by Roesch and Rowley (2005), the new instrument measured appraisal in

terms of two dimensions: challenge and threat. The nine items that measured the challenge

dimension focused on the caregiver's perception of his or her ability to master the demands of

the illness. The nine items that measured the threat dimension focused on the caregiver's

perception of the potential harm or losses associated with the illness. The referent for these

items was the caregiver rather than any physical or cognitive impairment that the pet might have

suffered as a direct result of the illness. For example, two of the items focus on the caregiver's

potential anxiousness about the symptoms and treatment of the illness.

The scale scores for each dimension of appraisal were the sum of the corresponding item

ratings, with higher response categories coinciding with stronger appraisals. Rather than using

the original 5-point scale anchored by *not at all* and *a great amount*, the response scale for the

new instrument used a 4-point scale of agreement. The main reason for making this change was

to align with the shift in the item prompt and compel the respondents to select a non-neutral

response. Whereas the items in the SAM were questions (Peacock & Wong, 1990), the phrasing

of the items in the new instrument was similar to phrasing of the items in the revised version of

the SAM tested by Roesch and Rowley (2005). Each item in the new instrument prompted the

caregiver to indicate whether he or she agreed with the corresponding statement using the response categories: *disagree*, *tend to disagree*, *tend to agree*, and *agree*. The rationale for the change in response categories was to better align with the item stems and be consistent with the other response scales.

4. <u>Locus of control</u>

A derivation of the MHLC scales developed by Wallston et al. (1978) was the instrument used for the locus of control variables. Similar to the MHLC, the new instrument (Beliefs about Control over Pet Health questionnaire, shown in the Appendix) measured three locus of control orientations: internal, powerful other, and chance. The main difference was that the new instrument referred to the pet's health rather than the person's health. Another difference in the content was the removal of references to being able to avoid illness (e.g., several items on the MHLC referred to the potential for the person becoming ill or getting sick). Because the pets in the context of the proposed study were already suffering from a chronic illness, some of the items in the new instrument were rephrased to refer to the potential worsening of the pet's condition.

Rather than using the 6-point scale of agreement from the original instrument, the present instrument used a 4-point scale. The main reasons for making this change were the findings obtained by Kelly et al. (2007) that suggested that a condensed scale might function better psychometrically and the recommendations made by Wolfe and Smith (20007a) for eliminating a neutral response category. Similar to the MHLC scales, the new instrument produced scale

scores that were the summed response values for the corresponding items, with the highest response category coinciding with the strongest locus of control.

5.   **<u>Family support</u>**

The instrument that assessed social support at the microsystem level in terms of the family's functioning coincided with the conflict, cohesion, and expressiveness subscales of the FES (Moos & Moos, 1983, 1994). The 27 items from these subscales comprised the Pet Caregiver Family Environment questionnaire (shown in the Appendix). Unlike the dichotomously scored items on the original FES, the items on the latter instrument used a polytomous scoring model with a 4-point scale of agreement similar to the scoring model used by Chipuer and Villegas (2001) but with different category labels. The main basis for this 4-point scale was to avoid having a neutral response category. The scale scores were the summed ratings of the corresponding items, with higher scores and higher response categories reflecting higher levels of each construct.

6.   **<u>Social support</u>**

The segment of the instrument that assessed social support beyond the microsystem was the Pet Caregiver System Support questionnaire (shown in the Appendix). This instrument contained one item that identified the caregiver's relationship with his or her pet and 14 items that measured social support in terms of the perceived attitudes that the caregiver's family, friends, and coworkers had towards the pet. Four of these items focused on the caregiver's microsystem, and the other items focus on the caregiver's mesosystems in terms of close friends

and coworkers. For each unit of the mesosystem, there were parallel items that assessed the appreciation for the relationship between the pet and caregiver, concern for the pet's health and well-being, and view of the pet as a family member, companion, or property. The basis for this set of statuses (family member, companion, and property) was the set of response categories used by the AVMA (2007) to categorize the statuses that people ascribed to their pets. The phrasing of the items on the Pet Caregiver System Support utilized declarative statements, and the response scale was a 4-point scale of agreement with an additional response category for *not applicable*. The raw scale score was the sum of the item ratings. With the exception of the items that assessed perceptions of the pet as property, the scoring was such that a higher response category indicated a stronger relationship status as a family member or companion and greater social support along this dimension. The property items were reverse-scored such that a lower response category corresponded to a stronger relationship status and social support.

7. Psychological adjustment

The instrument that measured psychological adjustment was a derivation of the Brief Symptom Index 18 (BSI-18). The BSI-18 is an 18-item version of the SCL-90-R that measures psychological distress in terms of three dimensions: depression, anxiety, and somatization (Derogatis & Fitzpatrick, 2004). With its shortened form, the BSI-18 was designed for use in situations with time constraints. The main reasons for using the condensed instrument in the present study was a focus on anxiety and depression and a desire to balance the informational yield with the burden of the caregiver responding to the additional items. The content of the

items used in the BSI-18 in the present study was the same as the SCL-90-R (Derogatis & Wise,

1989), but the response scale was different. Rather than the original 5-point response scale, the

modified version of the instrument used a 3-point scale. The main basis for this modification

was the finding obtained by Elliott et al. (2006) that suggested that the categories in the 5-point

scale were not significantly distinct from one another. Another modification to the version of the

BSI-18 used in the present study was the time frame for the response context. Rather than

prompting respondents to rate the extent to which they had experienced the corresponding stress

symptom within the past week, the revised directions prompted caregivers to rate the extent to

which they had experienced the corresponding stress symptom within the past month. The

purpose of this modification was to make the response frame more consistent across the

instruments.

C.   **Analysis**

In the preliminary analyses, the focus was on data screening and reverse coding. First,

the data underwent screening for unusable responses and excessive missing data. Caregivers

who had completed only one or two instruments or who were missing more than 10% of the

responses from a single instrument were removed from the dataset. Reverse coding then ensued

for items that contained negative phrasing or otherwise used a scoring model where a higher

response value corresponded to a lower value of the latent trait. The main analyses then

proceeded in two stages, consistent with the $QUAN_{Rasch} \rightarrow QUAN_{SEM}$ design. The initial stage

focused on examining the psychometric properties of the measurement instruments using Rasch

analysis. The second stage focused on the path analysis using SEM. This stage also included inferential statistics to address the research question that focused on the relationships between various components of the model and caregiver demographics.

1.   <u>**Rasch analysis**</u>

The main intent of the Rasch analyses was to empirically examine the functioning of the data collection instruments and transform the raw scale scores into interval measures for the subsequent path analysis. To facilitate this process, the rating scales from each instrument underwent Rasch analyses using Winsteps® software (Linacre, 2013). The first phase of this process generally entailed the application of the Rasch rating scale model to the items in each scale to examine support for the theoretical dimensionality of the corresponding items. The Rasch rating scale model is a widely used model that is applicable to polytomously scored data with more than two fixed-response categories (Bond & Fox, 2001; Wolfe & Smith, 2007a). Underlying the model is an assumption that the category thresholds are the same for every item within a scale. In the context of a Rasch model, a category threshold indicates the point on the latent trait continuum where the probability of endorsing a particular category is equal to the probability of endorsing the adjacent category (Bond & Fox, 2001; Elliott et al., 2006; Linacre, 2004, 2013). For example, the assumption of uniform category thresholds in an agreement scale means that the difficulty in selecting *strongly agree* over *agree*, for example, is the same for all of the items.

Following the application of the Rasch rating scale model was the application of the Rasch partial credit model to enable the category thresholds to vary across the items within each scale. A comparison of the relative values of the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) then provided a means of examining which model yielded the better fit. For the application of each model, the analyses generally entailed an inspection of the Rasch point-measure correlations, item fit statistics, and reliability estimates as well as analyses to test for the presence of DIF.

Checking the sign of the point-measure correlations provided a means of confirming the need for reverse coding items that contained negative wording. Rasch item-measure correlations are similar to traditional item-total raw score correlations in that both indicate how consistent the item scores are with the scores on the other items, but the Rasch correlations are more robust to missing data (Wolfe & Smith, 2007b). Of primary interest in the present analysis was the sign of the correlations, with a positive value indicating that higher response categories coincided with higher levels of the latent trait.

Item fit statistics provided primary evidence for examining the dimensionality of the items assigned to each scale, as well as an indication of how well the data fit the requirements of the Rasch model (Bond & Fox, 2001). With Rasch analysis there are two sets of fit statistics for both persons and items: infit statistics and outfit statistics. Both fit statistics are averages of the standardized response residuals, but the infit statistic is weighted towards unexpected responses that reflect lesser differences between ability and difficulty from the predicted responses whereas

the outfit statistic is unweighted. In accordance with Rasch literature (Bond & Fox, 2001; Linacre, 2004; Smith, 1999, 2004; Wolfe & Smith, 2007b), the criterion used to identify misfit was a standardized fit statistic greater than +2.0. Items that exceeded this cutoff were candidates for removal from the subsequent Rasch analyses.

There were follow-up examinations of the corresponding item responses to check for potential sources of the misfit, including DIF. Two demographic variables were the focus of the DIF analyses: the caregiver's gender and type of pet. The main basis for these considerations were evidence of potential differences between males and females in terms of the relative item difficulty associated with particular items measuring locus of control (Kelly et al., 2007) and levels of distress (Elliott et al., 2006). Thus, the main intent of the analyses was to determine the need to disaggregate the data by the caregiver's gender or type of pet or the need to discard items that showed large effect sizes. The two methods of investigating DIF were tests conducted in Winsteps (Linacre, 2013) and manual analyses using methods outlined by Smith (2010). These tests provided a means of assessing whether item difficulties were significantly different across the groups being compared. When DIF was present, there were two means used to investigate its impact. The first means was to examine the impact on the overall person measures of the construct being investigated. The second means was to examine the potential change in the caregiver's rank ordering or status based on his or her person measures with the items showing DIF excluded from the model versus included but rendered DIF-free (Smith, 2010).

Whereas the item fit indices provided evidence of the functioning of the items, similar indices for the rating scale provided evidence of the functioning of the response scale. These indices included category fit statistics, category measures, and category threshold measures. The same criterion used to assess item fit also applied to category fit in terms of standardized fit statistics. For the nonstandardized fit statistics, the expected value of 1.0 was the criterion for acceptable category fit, based on Rasch literature (Bond & Fox, 2001; R. M. Smith, 2004). For both the category measure and category thresholds, increasing values provided evidence of whether the response scale functioned as intended such that the higher value reflected a higher level of the underlying latent trait. The category thresholds also provided evidence of how distinct the response categories were from one another. Based on recommendations drawn from Rasch literature, 1.1 to 5.0 logits was the desired range for 4-point scales, and 1.4 to 5.0 logits was the desired range for 3-point scales (Bond & Fox, 2001; Linacre, 2004; Wolfe & Smith, 2007b). Response categories that had threshold separations within this range were considered distinct and contiguous.

Also of interest were the Rasch reliability estimates. Rasch analysis produces two sets of reliability estimates: person reliability and item reliability. The person reliability measure is analogous to measures of internal consistency such as Cronbach's alpha in that both provide an estimate of the amount of variance explained by the model, and both range from 0 to 1 (Bond & Fox, 2001; Linacre, 2013; Wolfe & Smith, 2007a, 2007b). Unlike measures of internal

consistency, though, the Rasch reliability estimate overcomes the limitations of estimating error variance based on a particular score distribution and requiring complete data.

2.   <u>**SEM**</u>

The optimized measures from the Rasch analyses were inputs to the path analysis using IBM SPSS Statistics and Amos (IBM Corporation, 2012a, 2012b). The main aim of this analysis was to address the research questions pertaining to how the relationships within the model explained the adjustment outcomes. Prior to the path analysis, each distribution underwent screening for outliers ($|z| \geq 4$) due to their influence on regression coefficients (Byrne, 2010; Tabachnick & Fidell, 2007). Cases identified as outliers were then removed from the dataset.

Consistent with path analysis, all of the variables in the tested model were manifest variables (Blunch, 2008; Kline, 2005; Tabachnick & Fidell, 2007). The categorical demographic factors, such as the caregiver's gender and whether there were financial concerns, were dummy-coded variables, and the other variables were continuous Rasch measures. Generalized least squares estimation was the method of parameter estimation, mainly because it relaxed the normality assumption of maximum likelihood estimation (Blunch, 2008; Stevens, 2009; Tabachnick & Fidell, 2007). Another basis for this selection was that simulation studies have also shown that generalized least squares estimation performed better than maximum likelihood estimateionfor sample sizes smaller than 500.

Upon the generation of the parameter estimates, including the regression coefficients, multiple indices were used to evaluate model fit. These indices included the chi-square statistic,

comparative fit indices such as the CFI, the normed fit index (NFI), Bentler and Bonnett's non-normed fit index (NNFI), and the root mean square error (RMSEA), and absolute indices such as the goodness-of-fit (GFI) and adjusted goodness-of-fit (AGFI). The CFI provided an indicator of how much better or worse the model fit was relative to a null model in which the variables were not correlated with one another. As a comparative index, the NNFI provided a means of adjusting the NFI for sample size (Stevens, 2009; Tabachnick & Fidell, 2007). In contrast to the chi-square fit statistic, the RMSEA examined the fit of the observed model relative to a perfect model (Tabachnick & Fidell, 2007). The use of multiple fit statistics helped overcome the limitations of individual indices. For example, simulations have shown that the use of the NFI and NNFI with small samples can present an issue of underestimation of model fit and that the chi-square statistic and RMSEA tend to overestimate model fit with small samples (Byrne, 2010; Tabachnick & Fidell, 2007). With the exception of the RMSEA and chi-square statistic, literature has generally deemed that fit statistics close to the maximum value of 1 indicate close model fit. However, there has been some controversy over the minimum value for good fit. For example, Tabachnick and Fidell have suggested .95 as a cutoff for the NNFI, whereas Stevens (2009) has reported that values below .90 may also reflect good fit. In the present study, values above 0.9 for the GFI, AGFI, NFI, and NNFI were the criteria for considering the fit to be close. The criterion for a close fit based on the RMSEA was a value of .06 or less, with values greater than 0.10 indicating poor fit, based on recommendations by Tabachnick and Fidell (2007).

IV.   RESULTS

There were 286 caregivers who participated in the study. After screening for unusable or excessive missing data, the final dataset contained 258 sets of responses. The vast majority of the caregivers participated via the Internet ($n = 237$, 91.86%), and the other 21 caregivers completed the print-based questionnaires (8.14%). Based on chi-square analyses, there were no statistically significant relationships between the mode of participation and caregiver demographics, $\chi^2(1, N = 258) = 0.06$, $p > .05$ (gender); $\chi^2(1, N = 258) = 0.84$, $p > .05$ (marital status); and $\chi^2(1, N = 258) = 0.15$, $p > .05$ (children living in the household). Nor was there a relationship between the participation mode and the type of pet, $\chi^2(3, N = 258) = 7.73$, $p > .05$. Therefore, the data from both groups were combined into one dataset.

A.   Caregiver Demographics

For demographic data, caregivers reported their age, gender, education, marital status, and whether there were children who were 16 years of age or younger living in the household. The caregivers' ages ranged from 21 to 83 years, with a median age of 47 ($M = 47.17$, $SD = 12.25$). As shown in Table I, the vast majority of the caregivers were female ($n = 236$, 91.47%), and more than half were married ($n = 145$, 56.20%). There were no children living with the majority of the caregivers ($n = 226$, 87.60%), and there was no association between marital status and whether the household included children, $\chi^2(1, n = 254) = 2.24$, $p > .05$. In terms of education, the caregivers reported a relatively high level, with the majority of the caregivers having completed at least some degree of college or university education ($n = 220$, 85.27%).

TABLE I
CAREGIVER DEMOGRAPHICS (N = 258)

Demographic Characteristic	*n*	%
Age		
20 – 29	19	7.36%
30 – 39	51	19.77%
40 – 49	72	27.91%
50 – 59	66	25.16%
60 – 69	37	14.35%
70 or older	7	2.71%
Gender		
Male	21	8.14%
Female	236	91.47%
Marital status		
Married	145	56.20%
Not married	109	42.25%
Children under the age of 16 years living in the household		
No	226	87.60%
Yes	30	11.63%
Highest education level		
High school or GED	35	13.57%
College or university	220	85.27%
Other	2	0.78%

When asked whether they had insurance that covered at least part of the pet's medical care, the majority of the caregivers reported that they did not have insurance (*n* = 221, 85.66%). Over half of these caregivers also reported having minor or major concerns about being able pay for the pet's medical care (refer to Figure 2). However, there was no association between the caregiver having insurance and his or her having concerns about being able to pay for the pet's

medical care, $\chi^2(2, n = 254) = 0.84, p > .05$. Of the 33 caregivers who reported having insurance, 26 caregivers also reported minor or major concerns about being able to pay for the pet's medical care. Overall, less than a third of the caregivers reported not being concerned about being able to pay for their pet's medical care ($n = 70$, 27.13%). One of the caregivers who completed the paper-based questionnaires also reported that "not being able to [pay for the pet's medical care]" would cause him or her major stress. There were also two caregivers who reported cost information about their pet's care, ranging from $100 to $500 on a monthly basis for treatment of diabetes, along with a caregiver who reported spending $4000 per stemcell treatment to treat arthritis.
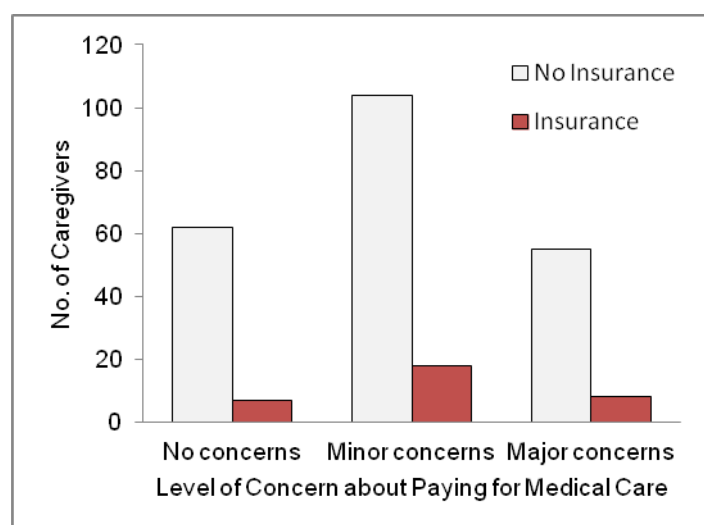

Figure 2. Insurance status and level of concern reported by caregivers about being able to pay for their pet's medical care.

B.   Pet Demographics

Pet demographics included the type of pet, the nature of the pet's relationship to the caregiver, and the type and duration of the illness. In terms of the type of pet, dogs were most prevalent ($n = 158$, 61.24%). Cats were the second most common type of pet, accounting for more than a third of the caregivers ($n = 96$, 37.21%). There were also two caregivers who were managing illnesses in horses, one caregiver who was managing the illness of a ferret, and one caregiver who was managing the illness of a miniature donkey.

In terms of the pet's relationship status, the vast majority of the caregivers considered their pets to be family members ($n = 230$, 89.15%). One caregiver explicitly assigned a child status to his or her dog: "I consider her to be like my child - little girl in a fur coat." As shown in Table II, there were also six caregivers (2.33%) who considered their pets to be both family members and companions. Another 16 caregivers (6.20%) considered their pets to be their companions only. The other caregiver who answered the item did not explicitly identify the relationship status of his or her pet but reported that "My pet was a major part in saving my life over ten years ago. My pet is a major part of my life." None of the 253 caregivers who reported their pet's relationship status viewed their pets as property. Based on the results of two-way chi-square analyses, there was no association between the pet's relationship status and the caregiver's gender or whether there were children in the household, $\chi^2(2, n = 252) = 0.50$, $p > .05$ and $\chi^2(2, n = 251) = 0.51$, $p > .05$, respectively. However, there was a statistically significant

association between the pet's relationship status and the caregiver's marital status, $\chi^2(2, n = 249)$ = 14.71, $p < .05$, Cramer's $V = .24$. Among the caregivers whose pet was a family member, the proportion of married caregivers was significantly higher than the proportion of nonmarried caregivers (60.62% versus 39.38%, respectively). Among the caregivers whose pet was a companion, the proportion of married caregivers was significantly lower than the proportion of nonmarried caregivers (12.50% versus 87.50%, respectively).

TABLE II
NUMBER AND PERCENTAGE OF CAREGIVERS BY PET'S RELATIONSHIP AND
CAREGIVER'S MARITAL STATUS

Pet's Relationship	Married			Not Married	
	No.	%		No.	%
Family member	137	53.10%		89	34.50%
Companion	2	0.73%		14	5.43%
Other[a]	3	1.16%		4	1.55%

[a]Includes the combined status of family member and companion but does not include the 5 caregivers who did not report their pet's relationship status.

As shown in Table III, there was a considerable range of illnesses represented among the pets. This range included illnesses and disorders that affected neurologic, digestive, cardiovascular, musculoskeletal, renal, respiratory, and endocrine-related functions as well as infectious diseases and blood/immune-related disorders. Endocrine-related illnesses, such as Addison's disease, acromegaly, Cushing's disease, thyroid disorders, and diabetes, accounted for

the highest percentage of the sample ($n = 83$, 32.17%). Addison's disease, also known as

hypoadrenocortism, is an illness in which the adrenal cortex does not secrete sufficient levels of

glucocorticoids for metabolizing protein, fat, and carbohydrates (Siegal & Barlough, 1995). In

contrast, Cushing's disease is a hyperadrenocortic condition in which the adrenal cortex secretes

excessive levels of glucocorticoids. Within the group of endocrine-related illnesses, diabetes

accounted for the largest subgroup ($n = 54$, 65.06%), and it was also the highest illness overall

(20.93%). Thyroid-related disorders were the second largest set of illnesses within the endocrine

group ($n = 14$, 16.87%) and accounted for 5.43% of the overall sample.

The second largest groups of illnesses were musculoskeletal disorders and urinary/renal

illnesses. Examples of musculoskeletal disorders represented by the sample included displaysia,

arthritis, disc disease, megaesophagus, masticatory myositis, and syringomyelia. Among the

musculoskeletal disorders, arthritis was the most prevalent condition ($n = 19$, 55.88%) and

accounted for 7.36% of the overall sample. Various forms of dysplasia had the second highest

representation within the illness group ($n = 5$, 14.71%) and accounted for 1.94% of the overall

sample. Renal disease accounted for 10.85% of the overall sample ($n = 28$) and 82.35% of the

corresponding illness group. The third largest group of illnesses comprised digestive disorders

($n = 24$, 9.30%). This group included colitis, irritable/inflammable bowel disease, and other

gastrointestinal illnesses. Within this group, bowel disease was the most prevalent disorder ($n = 8$, 33.33%), accounting for 3.10% of the overall sample.

TABLE III

NUMBER AND PERCENTAGE OF CAREGIVERS BY TYPE OF ILLNESS AND PET

Type of Illness	Type of Pet			Total	% of Caregivers
	Dog	Cat	Other		
Oncology	11	6	0	17	6.59%
Endocrine	48	34	1	83	32.17%
Neurologic	6	3	0	9	3.49%
Digestive	16	8	0	24	9.30%
Heart/Cardiovascular	14	5	0	19	7.36%
Respiratory/Thoracic	1	4	0	5	1.94%
Blood/Immune	4	6	0	10	3.88%
Skin	7	0	0	7	2.71%
Eye/Ear	4	0	0	4	1.55%
Musculoskeletal	29	3	2	34	13.18%
Urinary/Renal	11	23	0	34	13.18%
Nutritional	4	1	0	5	1.94%
Infectious	1	2	0	3	1.16%
(Other)	2	1	1	4	1.55%

$N = 258$.

Across the illnesses there was considerable diversity in the treatment regimens. A few caregivers reported treatment regimens that were only dietary in nature. In most of these cases, the illness was a nutritional disorder, but there were also cases in which the caregiver administered a restricted diet due to other conditions such as urinary or renal problems. Special or restricted diets were also common in cases where the caregiver was managing diabetes and other endocrine-related illnesses. Medication administered orally or by injection at least once a day was the most prevalent treatment regimen. For instance, many of the caregivers who were

managing diabetes reported administering insulin twice a day. Some of these caregivers also reported regular glucose monitoring at home or at a veterinary office. Chemotherapy and radiation treatment were also common among the caregivers who were managing various forms of cancer ($n = 17$, 6.59%). Hence, the caregivers reported treatment regimens administered at home as well as treatment regimens requiring administration by veterinary personnel (e.g., laser treatment and stem cell therapy). Other treatment regimens included enemas, acupuncture (primarily for dysplasia), and massage therapy.

In addition to there being a diverse array of illnesses and treatment regimens, there was also considerable variation in the length of time that the caregivers had been managing the illnesses. The number of months since the diagnosis ranged from half a month to 240 months, with a median of 24 months and a mean of 35.21 months ($SD = 35.69$). There were 7 caregivers (2.71%) who had been managing their pet's illness for 10 years or more. Five of these caregivers were caring for a cat, and the other two were caring for a dog and a horse. In terms of the course of the illnesses, over half of the caregivers reported that the illness was stable or in remission ($n = 148$, 57.36%). Less than a quarter of the caregivers reported that their pet's illness was getting worse ($n = 58$, 22.48%). Another 46 caregivers (17.83%) reported that the symptoms of their pet's illness were unpredictable.

C.   Optimization of Measures for the Model

Prior to answering the research questions, the Rasch analyses provided a means of optimizing the instruments used to measure each construct represented in the theoretical model.

These analyses transformed the raw scale scores into interval measures used to examine the relationships between the factors in the theoretical model and caregiver demographics (for the first research question) and to test the relationships in the model (for the latter two research questions). The following sections present the results of the Rasch analyses for each construct.

1. __Appraisal of the illness__

As shown in Table IV, there were nine items assigned to each dimension of appraisal. Since all of the items used positive phrasing, reverse coding was unnecessary.

TABLE IV
ITEMS THAT MEASURED CHALLENGE APPRAISAL AND THREAT APPRAISAL

Item	Item Content
Challenge2	I have the ability to overcome any stress of my pet's illness.
Challenge5	I can become stronger from managing my pet's illness.
Challenge6	I am eager to tackle my pet's illness.
Challenge7	I have the ability to maintain emotional balance.
Challenge9	I expect positive outcomes from my pet's illness.
Challenge12	I have the ability to maintain a positive relationship with my pet's primary veterinarian.
Challenge13	I have the ability to manage the symptoms of my pet's illness.
Challenge15	I have the ability to manage the treatment of my pet's illness.
Challenge17	I have the skills needed to overcome any stress of my pet's illness.
Threat1	My pet's illness has serious implications for my life.
Threat 3	I feel helpless when it comes to managing my pet's illness.
Threat 4	My pet's illness is beyond my control.
Threat 8	I feel anxious about the treatment of my pet's illness.
Threat 10	I feel anxious about the symptoms of my pet's illness.
Threat 11	Managing my pet's illness has a negative impact on me.
Threat 14	I feel helpless when it comes to the treatment of my pet's illness.
Threat 16	I feel threatened by my pet's illness.
Threat 18	My pet's illness will have long-term consequences on my stress level.

a. Challenge appraisal

With the Rasch rating scale model applied to the nine challenge items, there was neither disordering nor misfit among the category measures. There was misfit, however, in two items: Challenge6 and Challenge12. Challenge6 had the higher overall misfit (standardized infit = 4.9, standardized outfit = 3.6), and both the standardized infit and outfit of Challenge12 were 3.9. While neither Challenge12 nor Challenge6 showed evidence of DIF based on the caregiver's gender, Challenge6 showed a moderate DIF effect based on the type of pet (DIF effect = 0.55 logits). The overall item measure of Challenge6 was -0.22 logits, making it the third easiest item to endorse. For caregivers of dogs, the item measure was -0.45, compared to 0.10 logits for caregivers of cats, and this difference was statistically significant.

In addition to the DIF being a factor in the misfit of Challenge6, another suspected contributor was a potential interaction between with the item responses and the illness course. However, the results of a chi-square analysis of the item responses and the course of the illness revealed no association, $\chi^2(9, n = 254) = 11.07, p > .05$. Nor was there a correlation between the item response and the length of the illness, $r_s(254) = .09, p > .05$. Informal conversations with caregivers, along with a question mark written next to the item on one of the paper-based questionnaires, suggested that there may have been varying interpretations of the item content ("I am eager to tackle my pet's illness."). For example, some caregivers may have interpreted

"eager" to mean that they looked forward to dealing with the pet's illness. With this interpretation, caregivers may have been less likely to endorse the item at a higher level, compared to caregivers for whom eagerness reflected a sense of readiness.

For Challenge12, which had the lowest measure among the challenge items (-1.42 logits), the suspected source of the misfit was disordering among the category measures. The average level of challenge appraisal of caregivers who endorsed the lowest response category (*disagree*) was higher than the average challenge appraisal of caregivers who endorsed the higher response categories, which contradicted the assumption that higher response categories implied higher levels of the latent trait (Linacre, 2004, 2012). Suspected contributors to this disordering were potential confounds such as conflicts between the caregiver and veterinarian and the caregiver's perceptions of the veterinarian's empathy or detachment.

While Challenge6 was the only item to exhibit both misfit and DIF, Challenge2 was the only other item to show a moderate DIF effect of 0.50 or higher based on the type of pet. The overall item measure was 0.56 logits, making it the second most difficult item to endorse. For caregivers of dogs, the item measure was 0.73 logits, compared to 0.29 logits for caregivers of cats, suggesting that the latter group felt less able to overcome the stress of their pet's illness. However, tests of the impact of the DIF showed no changes in ranking among the caregivers based on their challenge measures with and without Challenge6 and Challenge2, $\kappa = 1.00$, $p < .05$.

The first attempt to optimize the challenge scale entailed collapsing the response scale of Challenge12 to two categories to try to eliminate the category disordering. This change also necessitated the substitution of the partial credit model for rating scale model to allow each item to have its own category structure. As shown in Table V, this model reduced both the AIC and BIC, indicating improved model fit. However, it did not reduce the original misfit or resolve the disordered categories for Challenge12.

The second attempt to optimize the scale entailed removing Challenge12 and Challenge6 from the scale due to the disordering of Challenge12 and both items having exhibited high misfit for caregivers of cats and dogs when analyzed separately. This modification produced a small reduction in the AIC and BIC but increased the effect size of the DIF in Challenge2 by 0.02 logits. The modification also produced misfit in two other items: Challenge5 and Challenge9. Due to the theoretical basis for retaining Challenge5 and Challenge9 as indicators of challenge appraisal, there were no further item removals.

TABLE V
AIC VALUES AND RELIABILITY INDICES FOR THE APPRAISAL SCALES

Scale/Scale Modifications[a]	AIC	BIC	Person Reliability	Cronbach's Alpha	Item Reliability
Challenge					
(No items removed, RS)	4508.20	5966.31	.72	.79	.98
Challenge12 rescored[b] (PC)	4209.73	5740.79	.72	.79	.98
Challenge12 and Challenge6 removed (RS)	3523.41	4880.64	.72	.80	.98
Challenge12 and Challenge6 removed (PC)	3532.90	4955.28	.72	.80	.98
Threat					
(No items removed, RS)	4768.06	6240.71	.83	.86	.99
(No items removed, PC)	4755.16	6319.14	.83	.86	.99
Threat4 removed (RS)	4068.92	5492.26	.84	.87	.99
Threat4 removed (PC)	4060.46	5561.94	.84	.87	.99
Threat4 and Threat1 removed (RS)	3482.69	4814.67	.82	.86	.99
Threat4 and Threat1 removed (PC)	3464.55	4861.51	.83	.86	.99

[a]RS = rating scale model. PC = Partial credit model. [b]Four response categories collapsed to a dichotomy.

Based on the AIC and BIC results, the optimized measures were obtained from the rating

scale model with Challenge6 and Challenge12 removed due to misfit. A suspected confound

between Challenge12 with the nature of the caregiver's relationship with the pet's veterinarian

provided additional support for the removal of this item, but the decision to remove Challenge6

was more equivocal. On one hand, there was theoretical support for retaining the item as an

indicator of challenge appraisal in that being eager to tackle the illness could reflect a desire for

mastery. On the other hand, there was evidence that at least one caregiver was not sure what the

item meant or did not know how to respond. The resolution was the removal of the item with a recommendation to revise the item to target the caregiver's *readiness* to tackle the illness rather than his or her *eagerness*.

b.   <u>Threat appraisal</u>

Unlike the set of challenge items, none of the threat items exhibited category disordering. The category measures met recommended guidelines for monotonically increasing category measures, and the category misfit was within acceptable levels based on Rasch literature (Linacre, 2004). The differences between adjacent step difficulties also met Linacre's (2004) recommendations for a 4-point rating scale.

There were no items that showed significant DIF based on the type of pet, but there were three items that showed significant DIF based on the caregiver's gender: Threat1, Threat 4, and Threat 8. Threat1, which had an overall item measure of -1.53 logits, was the easiest threat item to endorse. For male caregivers, the item measure was -2.49 logits, which was 1.03 logits lower than it was for female caregivers. Threat4 had an overall item measure of 0.06 logits, making it the fifth most difficult item to endorse. For male caregivers, the item measure was 0.74 logits, which was 0.75 logits higher than the item measure for female caregivers. The overall item measure of Threat8 was -0.53 logits, making it the third easiest item to endorse. For male caregivers, the item measure was -1.36 logits, which was 0.91 logits lower than the item measure for female caregivers. The directionality of the effects for Threat1 and Threat8 was consistent with literature suggesting that females shouldered more of the caregiving burden in the context

of managing human illness (Coffey, 2006; Thompson & Gustafson, 1996). In spite of the large

DIF effect at the item level, though, the removal of the DIF items did not alter the ranking of the

caregivers based on threat measures, $\kappa = 1.00$, $p < .05$.

The gender-based DIF in Threat1 and Threat4 was a suspected contributor to these items

exceeding the criterion for misfit (standardized infit = 3.1, standardized outfit = 2.2 [Threat1];

standardized infit = 5.4, standardized outfit = 6.3 [Threat4]). Threat1 also showed misfit for both

male and female caregivers when analyzed separately (standardized infit = 2.0, standardized

outfit = 1.3 [males]; standardized infit = 2.7, standardized outfit = 1.9 [females]). Follow-up

investigations for potential sources of the misfit of this item within the groups revealed that there

was a correlation between the item responses and two of the loci of control. There was a

negative relationship between the responses to Threat1 and the caregiver's internal locus as

measured by the summed IHLC score, $r_s(257) = -.22$, $p < .01$, $R^2 = .05$. This finding indicated

that caregivers who had a higher internal locus tended to endorse the item using lower response

categories. There was a positive relationship between the responses to Threat1 and the chance

locus as measured by the summed CHLC score, $r_s(257) = .26$, $p < .01$, $R^2 = .07$. There was no

association between the responses to Threat1 and the powerful other locus, $r_s(257) = .00$, $p > .05$.

In the analyses by gender, Threat4 exceeded the criterion for misfit for female caregivers

but not for male caregivers (standardized infit = 6.2, standardized outfit = 6.0 for females;

standardized infit = 2.0, standardized outfit = 0.8 for males). Similar to Threat1, the response to

this item also showed a correlation with the caregiver's locus of control. The correlation with

the IHLC score was negative, indicating that caregivers who had a higher internal locus tended to endorse Threat4 using lower response categories, $r_s(256) = -.41, p < .01, R^2 = .17$. There was a positive relationship between the item responses and the CHLC score, indicating that caregivers who had a higher chance locus tended to endorse Threat4 using higher response categories, $r_s(256) = .29, p < .01, R^2 = .08$. There was no association between the item responses and the powerful other locus, $r_s(256) = -.07, p > .05$.

Applying the partial credit model to the scale improved the AIC and BIC but had no impact on the misfit of Threat4 and only negligible impact on the misfit of Threat1. As shown in Table V, stepwise removal of Threat4 and Threat1 further decreased the AIC and BIC with little or no change in reliability. This modification also produced the lowest BIC of the models that were examined. However, the removal of both items also produced high misfit in Threat16. The model that produced the lowest AIC was the partial credit model with Threat4 and Threat1 removed. This model also increased the effect size of the DIF in Threat8 to 1.22 logits. The partial credit model of the threat items without Threat4 decreased the effect size of the DIF in Threat8 to 0.87 logits, with the item still being easier for female caregivers to endorse than for male caregivers to endorse. This model also reduced the effect size of the DIF in Threat1 to 0.99 logits.

AIC and BIC values played only a partial role in the selected optimization of threat appraisal. The model that produced the lowest AIC was the scale with Threat4 and Threat 1 removed and the remaining seven items analyzed with a partial credit scale model (refer to Table

V). However, the removal of Threat1 was counter to the theory underlying the nature of threat

appraisal (Lazarus, 1984; Peacock & Wong, 1990). In weighing the AIC and BIC against

theoretical underpinnings of threat appraisal, the scale consisting of the original nine items with

only Threat4 removed was more favorable.

2.   **Health locus of control**

There were six items assigned to each locus of control, as shown in Table VI. Given the

positive wording of all of the items, there was no need for reverse coding.

TABLE VI
ITEMS THAT MEASURED HEALTH LOCUS OF CONTROL

Item	Item Content
CHLC2	No matter what I do, if my pet is going to get sicker, my pet will get sicker.
CHLC4	Most things that affect my pet's health happen by accident.
CHLC9	Luck plays a big part in determining how soon my pet will recover from the illness.
CHLC11	My pet's good health is largely a matter of good fortune.
CHLC15	No matter what I do, my pet is likely to get sicker.
CHLC16	If it's meant to be, my pet will stay healthy.
IHLC1	It is my behavior that determines whether my pet's health improves.
IHLC6	I am in control of my pet's health.
IHLC8	I am to blame when my pet's condition worsens.
IHLC12	The main thing that affects my pet's condition is what I do.
IHLC13	If I take care of my pet, the illness will not get worse.
IHLC17	If I take the right actions, my pet can stay healthy.
PHLC3	If I have regular contact with my veterinarian, my pet is less likely to have health problems.
PHLC5	I can only maintain my pet's health by consulting veterinary professionals.
PHLC7	Other people play a big part in whether my pet stays healthy or become sicker.
PHLC10	Veterinary professionals control my pet's health.
PHLC14	The type of care that my pet receives from other people is what is responsible for how well my pet recovers from the illness.

Item	Item Content
PHLC18	Following the veterinarian's orders to the letter is the best way for me to keep my pet healthy.

Note. CHLC = Chance locus of control. IHLC = Internal locus of control. PHLC = Powerful other locus of control.

a. Chance locus of control

The initial model of the chance locus comprised the six CHLC items with the Rasch rating scale model applied. Under this model, the category structure met Linacre's (2004) guidelines for category fit and category measures. The structure also exhibited the recommended step differences between adjacent response categories. There were no items that exceeded the criteria for misfit and no items that showed DIF on the basis of the caregiver's gender or type of pet.

These conditions also held in the analysis with the application of the Rasch partial credit model. As shown in Table VII, this analysis produced a negligible decrease in the AIC and no change overall in the reliability estimates. With PHLC5 and PHLC14 included in the model due to their loading with the CHLC items in a follow-up Rasch principal components analysis of the collective set of items, PHLC5 exhibited substantive misfit with both the rating scale model and a partial credit model applied. PHLC14 did not misfit either alternative model, but the inclusion of the two items produced an increase in the AIC and BIC with a negligible reduction in both person and item reliabilities. This result further upheld the theoretical rationale for the distinction between the chance dimension and the powerful other dimension. The partial credit

model of the six CHLC items produced the measures with the lowest AIC (refer to Table VII),

but this value will also very close to the AIC produced by the rating scale model, which

produced the lowest BIC.

TABLE VII
AIC AND RELIABILITY INDICES FOR THE ITEMS THAT MEASURED HEALTH LOCUS
OF CONTROL

Scale/Scale Modifications	AIC	BIC	Person Reliability	Cronbach's Alpha	Item Reliability
Chance locus of control					
(No items removed, RS)	3588.95	4952.56	.64	.69	.97
(No items removed, PC)	3588.40	5005.06	.64	.69	.96
PHLC5 and PHLC14 added (RS)	4978.14	6466.46	.64	.67	.96
PHLC5 and PHLC14 added (PC)	4965.34	6532.28	.62	.67	.96
Internal locus of control					
(No items removed, RS)	3459.62	4875.28	.66	.69	.99
(No items removed, PC)	3417.81	4886.90	.67	.68	.99
IHLC1 removed (RS)	2779.56	4135.43	.63	.66	.99
IHLC8 removed (RS)	2851.87	4189.83	.68	.71	.98
IHLC8 removed (PC)	2809.39	4188.51	.68	.71	.98
IHLC1 and IHLC8 removed (RS)	2129.40	3374.70	.67	.70	.99
IHLC1 and IHLC8 removed (PC)	2126.64	3401.35	.68	.70	.98
Powerful other locus of control					
(No items removed, RS)	3668.75	5077.36	.68	.71	.99
(No items removed, PC)	3640.99	5102.95	.69	.71	.98
PHLC3 removed (RS)	3038.91	4369.47	.67	.71	.98
PHLC3 removed (PC)	3012.59	4384.24	.68	.71	.98
PHLC3 and PHLC7 removed (RS)	2310.02	3548.37	.69	.73	.99
PHCL3 and PHLC7	2282.71	3550.43	.70	.73	.99

removed (PC)

Note. RS = Rating scale model. PC = Partial credit model.

b. <u>Internal locus of control</u>

With the six IHLC items modeled as internal locus of control and analyzed using the

Rasch rating scale model, the items met recommended guidelines for monotonically increasing

category measures, and the category fit statistics were within Linacre's (2004) recommended

tolerances for misfit. The differences between adjacent step difficulties also met

recommendations for the range of 1.4 to 5 for a 4-point rating scale.

Investigations of DIF revealed no significant differences in the item measures based on

the caregiver's gender or type of pet. However, there were two items that exceeded the criterion

for misfit: IHLC1 and IHLC8 (standardized infit = 3.6, standardized outfit = 3.4; standardized

infit = 3.3, standardized outfit = 2.2, respectively). Both of these items were also relatively

difficult to endorse, with an item measure of 0.05 logits making IHLC1 the third hardest IHLC

item to endorse and an item measure of 2.00 logits making IHLC8 the most difficult IHLC item

to endorse. Since there were no disordered category measures, misfit among the categories, or

DIF based on the caregiver's gender or type of pet, the investigation of potential sources of the

misfit focused on potential interactions between the illness type and course. Across the 14

caregivers whose response residuals were significantly lower than predicted by the model, there

were a range of illnesses represented, including endocrine-related illnesses, musculoskeletal

conditions, digestive disorders, and immune-related problems. This finding revealed no apparent pattern between the caregiver's response to IHLC1 and the illness that he or she was managing. However, the results of two-way chi-square analysis confirmed a speculation about an interaction between the caregiver's responses to the item and the course of the illness, $\chi^2(9, n = 257) = 19.40, p < .05$, Cramer's $V = .27$. A higher percentage of caregivers whose pet's condition was stable or in remission tended to endorse the higher response categories, relative to the caregivers whose pet's condition was unpredictable or getting worse. Additionally, anecdotal evidence suggested that the reference to the pet's health improving may have generated different interpretations of IHLC1. For example, some caregivers may have considered an improvement to be a lack of complications (e.g., being in remission from seizures or other flare-ups, having glucose levels relatively controlled, etc.). Other caregivers may have interpreted an improvement to be more synonymous with the elimination of symptoms of the illness (e.g., no longer requiring insulin injections or requiring less insulin).

For IHLC8, which was the hardest IHLC item to endorse (item measure = 1.98 logits), there was an interaction suspected between the item responses and the illness course. However, the results of a two-way chi-square analysis did not support this supposition, $\chi^2(9, n = 256) = 7.83, p > .05$. Since the original version of this item had also exhibited misfit in the study conducted by Gehlert and Chang (1998), the other factor suspected in the misfit of IHLC8 was the wording of the item. The intent of IHLC8 ("I am to blame when my pet's condition worsens") was to convey a sense of the caregiver having a role in the pet's condition, but the

term *blame* may have been problematic for some caregivers. For example, anecdotal conversations with caregivers suggested that one interpretation was that the caregiver would be the cause of the illness getting worse, and another interpretation was that the caregiver's actions would be a key factor in the illness getting worse but would not be the *only* factor in the illness getting worse.

As shown in Table VII, stepwise removal of IHLC1 and IHLC8 from the rating scale model reduced the AIC and produced a negligible increase in person reliability. Neither the removal of IHLC1 nor IHLC8 produced misfit in other items. With the six items analyzed via the partial credit model, IHLC8 was the only item that exceeded the criterion for misfit (standardized infit = 3.5, standardized outfit = 2.4). The item also retained its status as the most difficult IHLC item to endorse with an item measure of 2.00 logits. Subsequent removal of IHLC8 further reduced the AIC with little or no change in reliability. The models that produced the lowest AIC and BIC were the ones with IHLC8 and IHLC1 removed. However, he selected optimization was the partial credit model with only IHLC8 removed. The main basis for this decision was theoretical in that the nature of IHLC1 was a strong indicator of internal locus.

c.   Powerful other locus of control

With the six PHLC items analyzed with the Rasch rating scale model, Linacre's (2004) guidelines for the category structure were met. None of the PHLC items exhibited DIF based on the caregiver's gender, but PHLC3 exhibited DIF based on the type of pet. The overall item measure was -1.09 logits, making PHLC3 the easiest PHLC item to endorse. For caregivers of

dogs, the item measure was -0.93 logits, which was significantly higher than the item measure for caregivers of cats (-1.36 logits). This difference logits suggested that the latter group of caregivers tended to perceive that regular contact with the vet would have less impact on reducing the pet's health problems. However, PHLC3 was also one of two items to exceed the criteria for misfit both for the combined group (standardized infit = 3.0, standardized outfit = 2.6) as well as for each type of pet individually (standardized infit = 3.1, standardized outfit = 2.7 for dogs; standardized infit = 3.0, standardized outfit = 3.0 for cats). While the DIF in PHLC3 was the most likely factor in the item exceeding the criterion for misfit for the combined group, the underlying reason for the DIF and misfit within the groups was unknown. Coincidentally, there was a significant correlation between the caregiver's responses to PHLC3 and his or her "ability to maintain a positive relationship with my pet's primary veterinarian" as measured by Challenge12, $r_s(256) = .37$, $p < .01$, $R^2 = .14$. This association suggested that there could be a potential confound between PHLC3 and the nature of the caregiver's relationship with the pet's veterinarian. If tension or conflict characterized the relationship, the caregiver may not have endorsed higher response categories even if he or she had a strong locus for a powerful other.

The other item that exceeded the cutoff for misfit was PHLC7 with a standardized infit of 3.4 and a standardized outfit of 3.7. With an item measure of 0.51 logits, PHLC7 was also the second most difficult PHLC item to endorse. The initial speculation for the misfit was a potential interaction with the course of the illness. However, the results of a two-way chi-square

analysis showed no association between the item responses and the illness course, $\chi^2(9, n = 255)$ = 7.52, $p > .05$.

Coincidentally, PHLC7 was one of two items that contained a generic reference to "other people" in contrast to the other PHLC items that referred to "veterinarians" or "veterinary professionals". The other similar item was PHLC14, which was the most difficult item to endorse but did not exceed the criterion for misfit (item measure = 0. 90 logits, standardized infit = -1.2, standardized outfit = -0.2). Whereas the reference to "other people" was somewhat generic in both items, the main difference was that PHLC14 also referred to "type of care", which implicitly set the reference to "other people" to people who were providing care for the pet. The other speculation for the misfit of PHLC7 was the reference to "stays healthy". The intended meaning of the phrase was the avoidance of complications. However, it is possible that some caregivers may have interpreted the item to mean that the pet could become illness-free. Since chronic illnesses are incurable, it is possible that these caregivers would have responded to the item differently from the way that other groups of caregivers might have responded.

With the partial credit model applied to the items, the misfit of both PHLC3 and PHLC7 improved, and the effect size of the DIF in PHLC3 decreased to 0.41 logits. Based on AIC and BIC values, the overall model fit also improved relative to the fit of the rating scale model (refer to Table VII). With PHLC3 removed from both a rating scale model and partial credit model, the misfit of PHLC7 worsened, but the AIC and BIC improved considerably. Subsequent removal of PHLC7 from both the rating scale and partial credit models further reduced the AIC

and slightly improved the person reliability. However, the removal of both PHLC3 and PHLC7 also caused PHLC14 to misfit. Iterative item removal ceased at this stage due to the remaining items being central to the powerful other locus. The scales that produced the lowest AIC and BIC were the partial credit model and rating scale model, respectively, with PHLC3 and PHLC7 removed. However, there was a stronger theoretical basis for retaining PHLC7. There was also a theoretical basis for retaining PHLC3, but this item exhibited unexplainable DIF and a potential confound with the caregiver's relationship with his or her veterinarian.

3.   Family Support

The 27 items that measured family dynamics are listed in Table VIII. As indicated in the table, reverse coding affected three items assigned to the cohesion scale, four items assigned to the conflict scale, and four items assigned to the expressiveness scale.

TABLE VIII
ITEMS THAT MEASURED FAMILY CONFLICT, COHESION, AND EXPRESSIVENESS

Item	Item Content
Cohesion1	Family members really help and support one another.
Cohesion2R	We often seem to be killing time at home.
Cohesion3	We put a lot of energy into what we do at home.
Cohesion4	There is a feeling of togetherness in our family.
Cohesion5R	We rarely volunteer when something has to be done at home.
Cohesion6	Family members really back each other up.
Cohesion7R	There is very little group spirit in our family.
Cohesion8	We really get along well with each other.
Cohesion9	There is plenty of time and attention for everyone in our family.
Conflict10	We fight a lot in our family.
Conflict11R	Family members rarely become openly angry.

Item	Item Content
Conflict12	Family members sometimes get so angry that they throw things.
Conflict13R	Family members hardly ever lose their tempers.
Conflict14	Family members often criticize each other.
Conflict15	Family members sometimes hit each other.
Conflict16R	If there's a disagreement in our family, we try hard to smooth things over and keep the peace.
Conflict17	Family members often try to one-up or out-do each other.
Conflict18R	In our family, we believe you don't ever get anywhere by raising your voice.
Express19R	Family members often keep their feelings to themselves.
Express20	We say anything we want to around the home.
Express21R	It's hard to "blow off steam" at home without upsetting somebody.
Express22	We tell each other about our personal problems.
Express23	If we feel like doing something on the spur of the moment we often just pick up and go.
Express24R	Someone usually gets upset if you complain in our family.
Express25	Money and paying bills is openly talked about in our family.
Express26R	We are usually careful about what we say to each other.
Express27	There are a lot of spontaneous discussions in our family.

Note. Items that have an *R* at the end of the item name were reverse coded.

a. **Family conflict**

With the Rasch rating scale model applied to the nine conflict items, the category measures met Linacre's (2004) guidelines for increasing category measures, category fit, and category step difficulties. Also, the four conflict items that had been reverse-coded had positive Rasch point-measure correlations. Contrary to expectations of DIF based on the caregiver's gender, results of DIF analyses suggested that there was no significant DIF between the males and females. Nor was there significant DIF based on the caregiver's type of pet.

With the nine conflict items analyzed via the rating scale model, there were two items that exceeded the criterion for misfit: Conflict12 and Conflict16R. Conflict12 had the higher misfit, with a standardized infit of 4.0 and a standardized outfit of 1.6, and was the second most difficult item to endorse (item measure = 1.65 logits). For Conflict16R, both fit statistics showed misfit, but the item was relatively easy to endorse (standardized outfit =4.2, standardized outfit = 3.6, item measure = -0.43 logits). Follow-up investigations into potential sources of the misfit revealed disordering among the response categories for Conflict12 such that the category measure for *tend to agree* (-1.06 logits) was lower than the category measure for *tend to disagree* (-0.97 logits). The most likely factor in this disordering was extremely low usage of the response categories for agreement ($n = 14$, 5.43%).

Unlike Conflict12, Conflict16R did not exhibit disordering among the category measures. There was an interaction suspected between the item responses and the caregiver's marital status, but the results of a two-way chi-square analysis did not support this supposition, $\chi^2(4, n = 253) =$ 8.10, $p > .05$. Nor was there an interaction between the item responses and whether there were children in the household, $\chi^2(4, n = 255) = .92, p > .05$. The other factor suspected in the misfit of Conflict16R was a potential confound since a disagreement would indicate conflict but "smoothing things over" could theoretically mollify the conflict. The item structure may have also posed a potential issue given that it was slightly more complex than the structure of the other items. Unlike most of the other items, Conflict16R was a compound statement that started with a nonrestrictive clause. Conflict18R had a similar structure, but this item did not exceed the

criterion for misfit (standardized infit = -0.9, standardized outfit = 0.04, item measure = -1.86 logits).

As shown in Table IX, the application of the partial credit model reduced the AIC. However, it did not improve the misfit of Conflict16R (standardized infit = 3.4, standardized outfit = 4.4, item measure = -0.28). Stepwise removal of Conflict12 and Conflict16R further reduced the AIC and BIC without having a substantive impact on the reliability estimates. However, it also produced misfit in Conflict17 (standardized infit = 2.3, standardized outfit = 2.2, item measure = 0.97 logits, rating scale model) and Conflict18R (standardized infit = 2.3, standardized outfit = 2.4, item measure = -0.87 logits, partial credit model). In follow-up analyses, Express26R was added to the conflict dimension based on its positive loading in a follow-up Rasch principal contrast analysis. With a rating scale model applied to the items, Express26R showed substantive misfit (standardized infit = 6.2, standardized outfit = 7.9) and increased the AIC and BIC considerably. The misfit of the item was even more pronounced in a partial credit model (standardized infit = 7.7, standardized outfit = 9.0). Thus, the partial credit model produced the best fit with Conflict12 and Conflict16R removed.

TABLE IX
AIC AND RELIABILITY INDICES FOR THE ITEMS THAT MEASURED FAMILY
COHESION, CONFLICT, AND EXPRESSIVENESS

Scale/ Scale Modifications	AIC	BIC	Person Reliability	Cronbach's Alpha	Item Reliability
Conflict					
(No items removed, RS)	3665.86	5023.97	.72	.75	.99
(No items removed, PC)	3613.33	5061.60	.73	.75	.98
Conflict12 (RS)	3390.52	4714.86	.73	.75	.99
Conflict12 (PC)	3365.21	4766.80	.73	.75	.98
Conflict12 and Conflict16R (RS)	2820.97	4159.56	.74	.75	.99
Conflict12 and Conflict 16R (PC)	2828.98	4103.06	.74	.75	.99
Express26R added (RS)	4477.44	5961.97	.71	.71	.99
Express26R added (PC)	4413.30	6002.21	.72	.71	.99
Cohesion					
(No items removed, RS)	3933.29	5343.60	.84	.93	.92
(No items removed, PC)	3898.65	5433.56	.84	.93	.94
Cohesion1 (RS)	3489.43	4839.39	.72	.70	.92
Cohesion1 (PC)	3485.68	4913.10	.72	.70	.85
Cohesion1 and Cohesion2R (RS)	2854.92	4090.15	.71	.70	.90
Cohesion1 and Cohesion2R (PC)	2843.96	4143.35	.71	.70	.71
Cohesion2R (RS)	3433.51	4901.60	.89	.93	.98
Cohesion2R (PC)	3241.54	4642.76	.82	.93	.94
Cohesion2R, Cohesion3, and Cohesion5R (RS)	2173.16	3878.30	.80	.93	.85
Cohesion2R, Cohesion3, and Cohesion5R (PC)	2189.47	3878.30	.79	.93	.86
Expressiveness					
(No items removed, RS)	5077.60	6563.65	.68	.65	.97
(No items removed, PC[a])	5062.83	6640.33	.68	.65	.95
Express23 (RS)	4281.37	5737.73	.72	.67	.99
Express23 rescored (PC)	4248.86	5764.66	.70	.67	.98
Express23 and Express26R added (RS)	3714.80	5079.39	.70	.66	.96
Express23 and Express26R added (PC)	3704.99	5134.82	.70	.66	.95

Scale/ Scale Modifications	AIC	BIC	Person Reliability	Cronbach's Alpha	Item Reliability
Express23, Express26R, and Express 25 added (RS)	3187.04	4501.25	.69	.64	.96
Express23, Express26R, and Express25 added (PC)	3175.33	4542.32	.69	.64	.95

Note. PC = Partial credit model. RS = rating scale model.

b.   **Family cohesion**

As expected, the three cohesion items that had been reverse coded had positive point-measure correlations from an application of the Rasch rating scale model. Also as expected, Linacre's (2004) guidelines were met for the category structure. Contrary to expectations, though, there was no significant DIF based on the caregiver's gender. Nor was there significant DIF based on the caregiver's type of pet.

Examination of the item fit statistics revealed two cohesion items that exceeded the criterion for misfit: Cohesion1 and Cohesion2R. Cohesion1 had a standardized infit of 2.3 and a standardized outfit of 2.2. With an item measure of -0.40 logits, it was also the second easiest item to endorse among the cohesion items. Cohesion2R had a standardized infit of 4.4, a standardized outfit of 5.1, and an item measure of 0.67 logits, making it was the most difficult item to endorse among the cohesion items. For Cohesion1, the misfit was likely due to disordered category measures, given that the category measure of *disagree* was higher than the category measure of *tend to disagree* (1.48 logits and 1.39 logits, respectively). This condition contradicted the assumption that higher response categories indicated higher levels of cohesion.

Follow-up analyses of the responses to Cohesion1 also showed an association with the caregiver's gender and marital status, $\chi^2(4, n = 257) = 12.78, p < .05$, Cramer's V = .22 and $\chi^2(4, n = 254) = 14.00, p < .05$, Cramer's V = .24, respectively. Caregivers who were married tended to endorse this item at higher levels than caregivers who were not married. There was no association between the item responses and whether there were children in the household, $\chi^2(4, n = 256) = 1.92, p > .05$. The other potential factor in the misfit of the item was the compound reference to family members helping *and* supporting one another. For example, some caregivers may have responded primarily on the basis of one rather than the other in cases where there might have been a substantive difference between help and support.

Unlike Cohesion1, Cohesion2R showed no disordering among the category measures. Nor was there an association between the responses to Cohesion2R and the caregiver's gender or marital status $\chi^2(4, n = 256) = 1.70, p > .05$ and $\chi^2(4, n = 253) = 6.63, p > .05$, respectively. There was also no interaction between the item responses and whether there were children living in the caregiver's household, $\chi^2(4, n = 255) = 0.93, p > .05$. The suspected cause of the misfit of Cohesion2R was content of the item, specifically the expression "killing time". Aside from the colloquialistic nature of the phrase, there may have also been other differences in interpretation. For example, caregivers who had active lives outside the home may have endorsed this item at a low level because they spent relatively little time at home but could still be highly cohesive. Similarly, caregivers who spent a lot of time at home may have still had have active lives and thereby endorsed the item at low levels too.

Application of the partial credit model did not resolve the category disordering for Cohesion1 but simultaneously collapsing the two *disagree* categories did. However, this modification did not reduce the misfit of the item (standardized infit = 0.3, standardized outfit = 8.4). It also worsened the misfit of Cohesion2R (standardized infit = 4.9, standardized outfit = 5.4) and introduced misfit in Cohesion3 (standardized infit = 2.6, standardized outfit = 2.4). As shown in Table IX, removal of Cohesion1 from the rating scale model and the partial credit model reduced the AIC values but also reduced the reliability estimates. It also reduced the misfit of Cohesion2R slightly (standardized infit = 4.5, standardized outfit = 4.9).

Subsequent removal of Cohesion2R from the rating scale model and partial credit model further improved the AIC with only small reductions in reliability overall. Since there was a strong theoretical basis for retaining Cohesion1, there were alternate analyses of models with only Cohesion2R removed. The rating scale model still produced misfit in Cohesion1 as well as in Cohesion3 (standardized infit = 4.2, standardized outfit = 2.3) and Cohesion5R (standardized infit = 4.2, standardized outfit = 2.3). The partial credit model produced similar results. Coincidentally, Cohesion3 and Cohesion5R also shared other similarity with Cohesion2R in that all of the items contained a reference "at home" in the item content. Another commonality among the items was that they referred to the family being active or engaged in activities. While engaging in activities as a unit could be an indicator of the family's cohesiveness, it could also reflect additional confounds. For example, family members may have shared a bond of being highly active but may still not have been a highly cohesive unit, or vice versa. As shown in

Table IX, removal of Cohesion2R, Cohesion3, and Cohesion5R from the rating scale model

produced the lowest AIC and BIC values. Concerns about potential confounds with other family

dynamics was another factor in the removal of these items.

c. __Family expressiveness__

As intended, the sign of the Rasch point-measure correlations of the four expressiveness

items that had been reverse coded was positive. Also as expected, Linacre's (2004) guidelines

were met for the category structure and fit. Similar to the other scales that measured family

dynamics, there was no DIF based on the type of pet. However, one item (Express22) showed

significant DIF based on the caregiver's gender. The overall item measure of Express22 was -

0.75 logits, making it the easiest item to endorse in the expressiveness scale. For females, the

item measure was -0.86 logits, which was 1. 02 logits lower than the item measure for the male

caregivers. In spite of the effect size of the DIF at the item level, though, the impact at the scale

level appeared to be minor. Moreover, there were only negligible differences in the rank

ordering of the caregivers based on their levels of expressiveness, $r(257) = 1.00$, $p < .01$.

Although Express22 did exhibit DIF, it was not one of the three expressiveness items that

exceeded the criterion for misfit. These items were Express23, Express 25, and Express26R.

Express23, which had a standardized infit of 4.1 and a standardized outfit of 4.2, was also

coincidentally the most difficult item to endorse (item measure = 0.75 logits). A check of

caregiver demographics showed no interaction between the item responses and the caregiver's

gender, marital status, or whether there were children in the household, $\chi^2(4, n = 257) = 1.75$, $p >$

.05; $\chi^2(4, n = 254) = 8.52, p > .05$; and $\chi^2(4, n = 256) = 1.66, p > .05$, respectively. Since the item targeted spontaneity within the family, there was an interaction suspected between the item responses and the course of the illness. For example, for caregivers who were managing illnesses that were unpredictable or were worsening might have endorsed lower response categories. However, the results of a two-way contingency analysis did not support this theory, $\chi^2(12, N = 258) = 13.64, p > .05$. The other main speculation for the misfit of this item was a potential confound between expressiveness and spontaneity, as the item content was "If we feel like doing something on the spur of the moment we often just pick up and go."

Express25 was the second easiest item to endorse among the expressiveness items (standardized infit =2.0, standardized outfit = 2.9, item measure = -0.62 logits). One of the factors suspected in the misfit of this item was the specificity of the item content. Unlike the generic nature of the other items, which did not refer to specific topics being expressed, Express25 referred specifically to the discussion of "money and paying bills"). It is possible that this specificity may have contributed to the item measuring a slightly different aspect of expressiveness. The item responses showed no association with the demographic variables, $\chi^2(4, n = 257) = 0.79, p > .05$ (gender), $\chi^2(4, n = 254) = 20.53, p > .05$ (marital status); $\chi^2(4, n = 256) = 0.57, p > .05$ (children). However, there was an association between the item responses and having concerns about being able to pay for the pet's care, $r_s(256) = -0.17, p < .05, R^2 = .03$. More caregivers who had concerns about finances tended to endorse the higher response categories.

Express26R, which had similar misfit, was the second most difficult item to endorse (standardized infit =1.7, standardized outfit = 2.5, item measure = 0.47 logits). This item exhibited disordering among the category measures for the *disagree* and *tend to disagree* response categories. Moreover, Express26R was coincidentally one of the two non-conflict items that had a positive factor loading in the first contrast of the Rasch principal component analysis of the conflict items. Although its inclusion with the conflict items produced substantive misfit, there could be a potential confound between these items and their respective scales. Application of the partial credit model with the categories of Express26R collapsed eliminated the disordering, but did not eliminate the misfit of the item (standardized infit = 2.7, standardized outfit = 2.9).

Upon removal of Express23 from the partial credit model, the misfit of Express26 worsened (standardized infit = 2.8, standardized outfit = 3.7). As shown in Table IX, though, the AIC values improved and there was a slight improvement in person reliability. Subsequent removal of Express26R further improved the AIC but not the BIC. The model that produced the lowest AIC was the partial credit model with the three misfitting items removed (Express23, Express26R, and Express25). However, the rating scale model of the other six items produced the lowest BIC.

4. <u>Social Support</u>

As shown in Table X, there were 14 items that measured social support. Responses to Social9 and Social14 were reverse coded to ensure that higher response categories coincided

with higher levels of social support. The need for this change was then confirmed empirically by examining the sign of the Rasch point-measure correlations to ensure that they were positive rather than negative. With the rating scale model applied, the correlations for both items were .33 and .71, respectively. Also with the rating scale model applied, all of the category measures met Linacre's (2004) guidelines for increasing category values and category fit. There were no social support items that showed DIF based on the caregiver's gender or type of pet.

TABLE X
ITEMS THAT MEASURED SOCIAL SUPPORT

Item	Item Content
Social1	My family appreciates my relationship with my pet.
Social2	My family feels the same way about my pet as I do.
Social3	My family cares about my pet's health.
Social4	My family cares about my pet's well-being.
Social5	My closest friends appreciate my relationship with my pet.
Social6	My closest friends care about my pet's health.
Social7	My closest friends care about my pet's well-being.
Social8	My closest friends think of my pet as a member of my family or as my companion.
Social9R	My closest friends think of my pet as property.
Social10	Most of my coworkers appreciate my relationship with my pet.
Social11	Most of my coworkers care about my pet's health.
Social12	Most of my coworkers care about my pet's well-being.
Social13	Most of my coworkers think of my pet as a member of my family or as my companion.
Social14R	Most of my coworkers think of my pet as property.

Note. Items that have an *R* at the end of the item name were reverse coded.

However, there were five items that exceeded the criterion for misfit: Social1, Social2, Social3, Social4, and Social9R. The first four of these items also shared an additional characteristic in that they targeted the caregiver's microsystem, which is the innermost level of Bronfenbrenner's (1977, 1979) theory, whereas Social9R targeted the microsystem. Given this condition, follow-up investigations for sources of the misfit focused on potential interactions between the caregivers' item responses and family structure. There were no interactions between the set of item responses and whether there were children in the caregiver's household. However, there was evidence of DIF based on marital status. For example, Social1, -2, -3, and -4 were significantly easier for married caregivers to endorse than they were for caregivers who were not married (as shown in Table XI). The largest difference occurred for Social1, which had an effect size of 1.68 logits, and had the second highest misfit overall. The item measure was -1.78 logits for married caregivers, compared to -0.10 for caregivers who were not married. The size of the smallest effect was -0.81 logits, which occurred for Social4.

While the DIF was a likely contributor in the misfit of these four items among the entire sample, it did not explain the misfit that the items exhibited when analyzed separately by marital status. All four of the microsystem items exceeded the criterion for misfit for both married caregivers and caregivers who were not married. Social1, which had a standardized infit and outfit of 4.2 for the combined group, had a standardized infit and outfit of 2.4 and 1.0, respectively, for married caregivers. The misfit was even more pronounced for caregivers who were not married (standardized infit = 6.0, standardized outfit = 5.1). The results were similar

for Social2, which had the highest overall misfit with a standardized infit of 3.9 and standardized

outfit of 6.1. The misfit increased to 4.3 and 5.3, respectively, for married caregivers and to 5.7

and 6.3, respectively, for caregivers who were not married. For both Social3 and Social4, the

results were similar but somewhat less pronounced. The infit exhibited misfit while the outfit

was at the cusp (standardized infit of 3.4, standardized outfit = 2.0 for Social3; standardized infit

= 2.9, standardized outfit = 1.9 for Social4). These two items were also very similar in item

content, and their item difficulties for the combined group were practically the same (-0.53 and -

0.54 logits, respectively). When analyzed separately by marital status using the Rasch rating

scale model, their item measures were also very close (-1.17 and -1.05, respectively). Also when

analyzed separately by marital status, Social3 still exhibited misfit for the caregivers who were

not married (standardized infit = 3.6, standardized outfit = 1.0). Disordered category measures,

which occurred for the categories *tend to disagree* and *tend to agree*, was the suspected factor in

this misfit. Social4 also exhibited misfit for both sets of caregivers (standardized infit = 2.2,

standardized outfit = 0.5 for married caregivers and standardized infit = 2.9, standardized outfit =

1.1 for nonmarried caregivers).

TABLE XI
MEASURES OF SOCIAL SUPPORT ITEMS THAT SHOWED DIF BASED ON THE
CAREGIVER'S MARITAL STATUS

Item	Rating Scale Model		Partial Credit Model	
	Married	Nonmarried	Married	Nonmarried
Social1	-1.32	0.01	-0.89	0.04
Social2	-0.42	0.64	-0.54	0.54
Social3	-1.17	-0.02	-0.81	0.05
Social4	-1.05	-0.24	-0.68	0.01
Social10	0.89	0.47	0.85	0.42
Social12	0.93	0.55	1.05	0.62
Social13	0.85	0.46	0.89	0.39

Note. Only items that showed DIF based on marital status are included.

Unlike Social1, Social2, Social3, and Social4, which exhibited both misfit and DIF, Social9R exhibited misfit but not DIF. With the rating scale model applied to the items, Social9R had a standardized infit of 2.7, a standardized outfit of 3.2, and an item measure of -0.54 logits, making it the third easiest item to endorse. Another characteristic that distinguished Social9R from the other four items was that it targeted the caregiver's mesosystem rather than microsystem (i.e., close friends versus family). Specifically, the item focused on the caregiver's belief about whether his or her closest friends viewed the pet as property. There was very low usage of the lower response categories before the reverse coding, and given the pervasiveness of the caregivers viewing their pets as family members ($n = 230$, 89.15%), the extreme nature of the former view may have contributed to the functioning of the item.

With the microsystem items analyzed separately with the rating scale, there was disordering among the category measures and one item that exceeded the criterion for misfit

(Social3). Application of the partial credit model did not resolve the problem, and collapsing adjacent response categories was not a logical option due to the conceptual differences in the categories. With the rating scale model applied just to the items that targeted the caregiver's mesosystem, Social9R still exhibited considerable misfit along with Social5. Unexpectedly, Social9R showed evidence of statistically significant DIF under this model (DIF effect = -0.61 logits), with the item measure being lower for the married caregivers. Applying the partial credit model increased the DIF effect by a magnitude of 0.01 logits and did not improve the fit of either Social5 or Social9R. Analyzing the items separately by the caregiver's marital status did not eliminate the misfit of Social9R but did for Social5 for the married caregivers only. For Social5, which did not exhibit statistically significant DIF, the source of the misfit was not readily apparent. Coincidentally, the standardized outfit of Social14R, which was a parallel item to Social9, was at the cusp of misfit, while the standardized infit was within the preset tolerance (standardized infit = -1.8, standardized outfit = 1.9, item measure = 0.74 logits). Unlike Social9R, though, Social14 did not exhibit DIF with the mesosystem items. Stepwise removal of Social9R and Social5 produced improvements in AIC values and some improvements in reliability. However, these models also resulted in misfit in several other items.

   When analyzed separately for married caregivers, Social9R and Social14R were the only items to exhibit substantive misfit. With this items removed from the separate analyses with the rating scale model applied, Social5 exhibited misfit for caregivers who were not married (standardized infit = 2.3, standardized outfit = 2.5) and was right at the cutoff for the married

caregivers (standardized infit and standardized infit at 2.0). With the rating scale model applied to the items, Social7 exhibited misfit for married caregivers only. In contrast, Social6 exhibited misfit for the caregivers who were not married but not for the caregivers who were married. Applying the partial credit model to the data for each group did not resolve the problem.

Although there was a theoretical basis for retaining the items that showed DIF, the misfit in the initial and follow-up analyses suggested that several of the items were problematic aside from the DIF. Neither the theorized unidimensional model nor the separate analysis of the two underlying dimensions (microsystem and mesosystem) produced satisfactory psychometric properties. Therefore, descriptive and inferential statistics have been omitted for the social support variable.

5. Adjustment

As shown in Table X, there were 12 items from the BSI-18 that measured depression and anxiety. There were also six items that measured somatization. However, these items were omitted from the analyses because somatization was not a construct in the proposed model of caregiver adjustment.

TABLE XII
ITEMS THAT MEASURED PYSCHOLOGICAL ADJUSTMENT

Item	Item Content	Item	Item Content
Anxiety3	Nervousness or shakiness inside	Somat1	Faintness or dizziness
Anxiety6	Feeling tense and keyed up	Somat4	Pains in heart or chest
Anxiety9	Suddenly scared for no reason	Somat7	Nausea or upset stomach
Anxiety12	Spells of terror and panic	Somat10	Trouble getting your breath
Anxiety15	Feeling so restless you couldn't sit still	Somat13	Numbness or tingling in part of your body
Anxiety18	Feeling fearful	Somat16	Weakness in parts of your body
Depress2	Feeling no interest in things		
Depress5	Feeling lonely		
Depress8	Feeling blue		
Depress11	Feelings of worthlessness		
Depress14	Feeling hopeless about the future		
Depress17	Thoughts of ending your life		

a.   Depression

With the Rasch rating scale model applied to the six depression items, the category fit and structure met Linacre's (2004) guidelines. The threshold distances also met Linacre's (2004) recommended guidelines for a 3-point scale. These findings also provided empirical support for the reduced version of the original response scale designed for the BSI-18.

There were no items that exhibited DIF on the basis of the type of pet, but one item (Depress17) showed gender-related DIF. The overall item measure was 4.36 logits, making Depress17 the most difficult depression item to endorse. For male caregivers, the item measure was 1.83 logits, which was 3.66 logits lower than the item measure for female caregivers.

Coincidentally, Depress17 also had the least amount of variation in the item responses. There were only seven caregivers that used the middle or highest response category. Females accounted for four of these responses, and males accounted for the other three responses. Depress17 was also one of two items to exceed the criterion for misfit albeit only slightly (standardized infit = 2.1, standardized outfit = -0.4). However, the test of the impact of the DIF showed that removal of the item did not significantly change the classification of caregivers based on their "caseness" for depression (White, 2004), κ = .94, p < .05.

The other depression item that exceeded the criterion for misfit was Depress8 with a standardized infit of -1.2 and a standardized outfit of 5.1. At an item measure of -2.09, Depress8 was also the easiest item to endorse. Application of the partial credit model eliminated the misfit of both Depress8 and Depress17 without causing other items to misfit. As shown in Table XIII, the application of the partial credit model also reduced the AIC with a negligible reduction in person reliability. Application of the partial credit model also reduced the effect size of the DIF in Depress17 from 3.66 logits to 3.05 logits. Thus, the optimized measures were based on the Rasch partial credit model.

TABLE XIII
AIC AND RELIABILITY INDICES FOR THE ITEMS THAT MEASURED
PSYCHOLOGICAL ADJUSTMENT

Scale	Model Applied	AIC	BIC	Person Reliability	Cronbach's Alpha	Item Reliability
Depression	RS	1158.91	1826.59	.66	.84	.98
	PC	1146.87	1838.06	.65	.84	.97
Anxiety	RS	1163.79	1854.17	.62	.85	.98
	PC	1153.76	1867.78	.60	.85	.97

Note. RS = Rating scale model. PC = Partial credit model.

b.   **Anxiety**

Similar to the items that measured depression, the items that measured anxiety met

Linacre's (2004) guidelines for category structure with the Rasch rating scale model. Also

similar was the absence of DIF based on the caregiver's type of pet. However, there was one

item (Anxiety15) that showed gender-related DIF. The overall item measure was 0.08 logits,

rendering Anxiety15 as the third easiest to endorse. For male caregivers, the item measure was -

1.67, which was 2.01 logits lower than the item measure for female caregivers. The DIF was

likely a contributor to Anxiety15 having a fit statistic just above the cutoff for misfit

(standardized infit = 2.1, standardized outfit = 1.4). Follow-up investigations of the impact of

the DIF revealed that there was no change in the classification of caregivers based on their

caseness for anxiety, $\kappa = 1.00$, $p < .05$. Application of the partial credit model eliminated the

misfit (standardized infit = 1.5, standardized outfit = 1.4) and reduced the effect size of the DIF.

Thus, the optimized measures were based on the Rasch partial credit model.

D.   <u>**Relationships between the Model Factors and Caregiver Demographics**</u>

Table XIV shows the means and standard deviations for the optimized interval measures generated from the Rasch analyses, which were used to test for relationships between the model factors and caregiver demographics. Across the distributions, skewness was relatively nominal, and there were few outliers. The distribution that had the highest skew was anxiety (M = -3.15, SD = 2.44, skew = 0.92). The two distributions that had the second highest skew were challenge appraisal (M = 1.35 logits, SD = 1.60, skew = 0.76) and depression (M = -3.19 logits, SD = 2.49, skew = 0.75). Neither of the distributions for adjustment nor appraisal contained outliers. Nor were there outliers in the distributions for internal locus of control, powerful other locus of control, family expressiveness, and family conflict. However, the distributions for family cohesion and chance locus of control had six outliers and one outlier, respectively. These data were subsequently removed from the dataset.

For the first research question, the Rasch measures of cognitive appraisal, locus of control, family support, and psychological adjustment were used to test for relationships between these factors and caregiver demographics. The demographics included gender, education, marital status, and age. There were also analyses to test for potential relationships between various factors in the model and illness parameters such as the length and course of the illness.

TABLE XIV
MEANS AND STANDARD DEVIATIONS

Construct	Dimension	Rasch Measures		Raw Scores	
		M	SD	M	SD
Cognitive appraisal	Challenge	1.35	1.60	21.48	3.92
	Threat	-0.52	1.89	18.40	5.38
Locus of control	Chance	-0.76	1.23	12.61	3.42
	Internal	0.69	1.54	13.92	2.93
	Powerful other	-0.24	1.44	12.03	3.16
Family support	Conflict	-2.06	1.91	12.31	3.70
	Cohesion	3.86	2.22	20.12	3.66
	Expressiveness	1.10	1.52	17.84	3.70
Psychological adjustment	Depression	-3.19	2.49	8.32	2.64
	Anxiety	-3.15	2.44	8.14	2.65

1.   **Cognitive Appraisal**

The results of inferential statistics indicated that the caregiver's demographics did not influence appraisal. An independent-means t-test of the appraisal measures based on the caregiver's gender revealed no significant differences in challenge or threat appraisal between males and females, $t(255) = 1.58$, $p > .05$, 95% CI [-0.14, 1.29]; $t(255) = 0.43$, $p > .05$, 95% CI [-0.65, 1.05]). Nor were there differences in appraisal measures on the basis of the caregiver's marital status, $t(252) = -0.51$, $p > .05$, 95% CI [-.50, .29] and $t(252) = -0.05$, $p > .05$, 95% CI [-0.49, 0.46] for challenge or threat, respectively. There was also no difference in appraisal on the basis of whether there were children in the household, $t(254) = 1.14$, $p > .05$, 95% CI [-0.26, 0.97] and $t(254) = -.37$, $p > .05$, 95% CI [-.86, .60], for challenge and threat, respectively. Nor was there a difference in appraisal on the basis of education, $F(2, 254) = 1.26$, $p > .05$

(challenge) and $F(2, 258) = 0.00$, $p > .05$ (threat). There was no correlation between the caregiver's age and either challenge or threat appraisal, $r(251) = .00$, $p > .05$ and $r(251) = -.05$, $p > .05$, respectively.

While there was no correlation between either challenge appraisal or threat appraisal and the length of the illness, $r(256) = .02$, $p > .05$ (challenge), $r(256) = -.06$, $p > .05$, there was an interaction between appraisal and the course of the illness, $F(3, 192) = 6.59$, $p < .05$, partial $\eta^2 = .09$ (challenge) and $F(3, 192) = 6.74$, $p < .05$, partial $\eta^2 = .09$ (threat). Post hoc analyses using Tukey's HSD test indicated that the mean challenge appraisal for caregivers whose pet's illness was stable or in remission was 1.75 logits ($SD = 1.66$), which was significantly higher than the mean challenge appraisal for the caregivers whose pet's illness was getting worse ($M = .68$, $SD = 1.25$) or was unpredictable ($M = 0.89$, $SD = 1.31$). Threat appraisal was significantly lower for the caregivers who were managing an illness that was stable or in remission ($M = -1.10$, $SD = 1.97$) than it was for caregivers who were managing an illness that was getting worse or was unpredictable ($M = 0.02$, $SD = 1.57$; $M = 0.22$, SD = 1.61, respectively). There were also significant correlations between both challenge and threat appraisal and the level of concern about the financial demands of the illness, $r_s(256) = -.25$, $p < .05$, $R^2 = .06$ and $r_s(256) = .30$, $p < .05$, $R^2 = .09$, respectively. Greater concerns tended to associate with lower challenge appraisal and higher threat appraisal. There was also an interaction between threat appraisal and whether the caregiver had veterinary insurance, $t(252) = -2.39$, $p < .05$, with threat appraisal being higher

among caregivers who did not have insurance ($M = 0.22$, $SD = 1.80$). There was no significant difference in challenge appraisal on the basis of having insurance, $t(252) = 0.33$, $p > .05$.

2. **Locus of Control**

In terms of demographics, there were no significant differences in chance locus or powerful other locus on the basis of the caregiver's gender, $t(254) = 1.94$, $p > .05$, 95% CI [-0.01, 1.08]; $t(254) = -0.01$, $p > .05$, 95% CI [-0.67, 0.66], respectively. However, there was a significant difference in internal locus on the basis of gender, $t(254) = 2.82$, $p < .05$, 95% CI [0.30, 1.70]. The internal locus of male caregivers was significantly higher than the internal locus of female caregivers ($M = 1.62$, $SD = 1.59$ and $M = 0.62$, $SD = 1.52$, respectively).

None of the locus of control variables showed significant differences on the basis of the caregiver's marital status, $t(251) = -1.60$, $p > .05$, 95% CI [-0.54, 0.06]; $t(251) = -0.47$, $p > .05$, 95% CI [-0.48, 0.30]; and $t(251) = 0.33$, $p > .05$, 95% CI [-0.30, 0.43] for chance, internal, and powerful other, respectively. Nor were there significant differences in locus of control on the basis whether there were children in the household, $t(252) = -1.29$, $p > .05$, 95% CI [-0.76, 0.16] for the chance locus, $t(252) = 0.86$, $p > .05$, 95% CI [-0.33, 0.85] for the internal locus; and $t(252) = 0.01$, $p > .05$, 95% CI [-0.55, 0.56] for the powerful other locus. There were also no significant differences in chance, internal, or powerful other locus based on the caregiver's education, $F(2, 253) = 0.41$, $p > .05$ (chance); $F(2, 253) = 0.79$, $p > .05$ (internal); $F(2, 253) = 0.03$, $p > .05$ (powerful other). Nor was there a significant correlation between the caregiver's

orientation and his or her age, $r(250) = .05$, $p > .05$ (chance); $r(250) = .04$, $p > .05$ (internal); $r(250) = .10$, $p > .05$ (powerful other).

3. Family Support

In terms of demographics, there were no significant differences in family functioning on the basis of the caregiver's gender, $t(249) = 0.25$, $p > .05$, 95% CI [-0.75, 0.97] for conflict; $t(249) = -1.61$, $p > .05$, 95% CI [-1.81, 0.18] for cohesion, $t(249) = -1.79$, $p > .05$, 95% CI [-1.29, 0.06] for expressiveness. However, there were significant differences on the basis of marital status, $t(246) = -2.38$, $p < .05$, 95% CI [-1.06, -0.10] for conflict, $t(246) = 4.69$, $p < .05$, 95% CI [0.74, .1.82] for cohesion; and $t(246) = 3.21$, $p < .05$, 95% CI [0.24, 1.00] for expressiveness. Cohesion and expressiveness were higher among caregivers who were married ($M = 4.40$, $SD = 2.20$ and $M = 1.36$, $SD = 0.61$, respectively) than they were among caregivers who were not married ($M = 3.12$, $SD = 2.26$ and $M = 0.74$, $SD = 1.32$, respectively). In contrast, conflict was significantly lower for married caregivers than it was for caregivers who were not married ($M = -2.32$, $SD = 1.84$ versus $M = -1.74$, $SD = 1.98$).

There were no significant differences on the basis whether there were children in the household, $t(248) = -1.26$, $p > .05$, 95% CI [-1.20, 0.26] for conflict; $t(248) = -0.13$, $p > .05$, 95% CI [0.79, 0.91] for cohesion, and $t(248) = -0.73$, $p > .05$, 95% CI [-0.80, 0.37] for expressiveness. Nor were there significant differences based on the caregiver's education, $F(2, 248) = 1.13$, $p > .05$ (conflict); $F(2, 248) = 0.63$, $p > .05$ (cohesion); $F(2, 248) = 0.37$, $p > .05$ (expressiveness). Nor was there a significant correlation between the caregiver's family functioning and his or her

age, $r(245) = -.10$, $p > .05$ (conflict); $r(245) = -.07$, $p > .05$ (cohesion); $r(245) = -.07$, $p > .05$ (expressiveness).

4. Adjustment

In terms of demographics, there were no significant differences in depression or anxiety on the basis of the caregiver's gender $t(205) = 1.23$, $p > .05$, 95% CI [-0.46, 1.96] and $t(205) = 1.80$, $p > .05$, 95% CI [-0.10, 2.27], respectively. Nor were there significant differences in anxiety on the basis of the caregiver's marital status, $t(202) = 0.74$, $p > .05$, 95% CI [-0.44, 0.93]. However, there were significant differences in depression, $t(202) = -2.54$, $p < .05$, 95% CI [-1.57, -0.20]. The mean level of depression for married caregivers was -3.57 (SD = 2.43), compared to -2.68 (SD = 2.50) for caregivers who were not married. There were no significant differences in depression or anxiety based on whether there were children in the household, $t(205) = 0.65$, $p > .05$, 95% CI [-0.70, 1.40] and $t(205) = -0.55$, $p > .05$, 95% CI [-1.32, 0.74]. Nor were there differences based on the caregiver's education, $F(2, 204) = 1.08$, $p > .05$ (depression) and $F(2, 204) = 1.14$, $p > .05$ (anxiety). There was no correlation between the level of depression or anxiety and the caregiver's age, $r(203) = -.07$, $p > .05$ and $r(203) = -.05$, $p > .05$, respectively.

There was no correlation between depression or anxiety and the length of the illness, $r(206) = .05$, $p > .05$ and $r(206) = -.02$, $p > .05$, respectively. However, there was an interaction with the course of the illness, $F(3, 204) = 3.46$, $p < .05$, partial $\eta^2 = .05$ (depression) $F(3, 204) = 3.24$, $p < .05$, partial $\eta^2 = .05$ (anxiety). Post hoc analyses using Tukey's HSD test indicated that both depression and anxiety were significantly higher for caregivers whose pet's illness was

getting worse (M = -2.48, SD = 2.53 for depression and M = -2.26, SD = 2.92 for anxiety), compared to the adjustment of caregivers whose pet's illness was stable or in remission (M = - 3.64, SD = 2.30 for depression and M = -3.53, SD = 2.19 for anxiety). There was also a significant correlation between both depression and anxiety and the level of concern about the financial demands of the illness, $r_s(206)$ = .21, $p < .05$ and $r_s(206)$ = .16, $p < .05$. Greater concerns tended to associate with higher levels of depression and anxiety. There was no interaction between either depression or anxiety and whether the caregiver had veterinary insurance $t(203)$ = 0.87, $p > .05$ (depression) and $t(203)$ = -0.24, $p > .05$ (anxiety).

E.   Results of the Path Analysis

The results of the path analysis addressed the research questions that focused on how the factors in the model contributed to adjustment and how well the model accounted for the variance in adjustment outcomes. After the removal of outliers, the dataset used for the path analysis contained complete data for 196 caregivers. Female caregivers accounted for the vast majority of the caregivers (n = 180,180 91.84%), and over half of the caregivers were married (n = 111, 56.63%). In terms of the course of the illness, there were 39 caregivers (19.90%) whose pet's illness was getting progressively worse. Almost three quarters of the caregivers had at least some level of concern about the financial aspects of the illness (n = 145, 73.98%).

Scatterplots provided visual evidence of the presence or absence of suspected linear relationships among the variables. Between the appraisal measures and the control measures, there was a visually discernible relationship between all of the pairs except for challenge

appraisal and PHLC. As shown in Table XV, most of these relationships were statistically significant. Chance orientation had a negative correlation with challenge appraisal, $r(195) = -.40, p < .01, R^2 = .16$, but had a positive correlation with threat appraisal, $r(195) = .45, p < .01, R^2 = .20$. In contrast, internal orientation had a positive correlation with challenge appraisal, $r(195) = .42, p < .01, R^2 = .17$, and a negative correlation with threat appraisal, $r(195) = -.31, p < .01, R^2 = 0.10$. PHLC had a significant positive correlation with threat appraisal, $r(195) = .15, p < .05, R^2 = .02$, but not with challenge appraisal, $r(195) = -.11, p > .05$. There was a positive relationship hypothesized between challenge appraisal and the length of the illness, but the results of correlation analyses did not support this speculation, $r(195) = .05, p > .05$. Nor did the results show a significant relationship between threat appraisal and the length of the illness, $r(195) = -.07, p > .05$.

There was a significant negative relationship between challenge appraisal and both depression and anxiety, $r(195) = -.30, p < .01, R^2 = 0.09$ and $r(195) = -.35, p < .01, R^2 = 0.12$, respectively. There were also significant negative correlations between depression and family cohesion and expressiveness, $r(195) = -.36, p < .01, R^2 = 0.13$ and $r(195) = -.34, p < .01, R^2 = .12$, respectively. In contrast, threat appraisal had a positive correlation with both threat and depression, $r(195) = .40, p < .01, R^2 = 0.16$ and $r(195) = .51, p < .01, R^2 = 0.26$. There was also a positive relationship between depression and the chance orientation, $r(195) = .24, p < .01, R^2 = .06$, as well as family conflict, $r(195) = .35, p < .01, R^2 = .12$. The results for anxiety showed a similar pattern. There was a positive relationship between anxiety and chance orientation, $r(195)$

$= .29$, $p < .01$, $R^2 = .09$, as well as anxiety and family conflict, $r(195) = .29$, $p < .01$, $R^2 = .08$.

There were negative relationships between anxiety and both family cohesion and expressiveness, $r(195) = -.19$, $p < .01$, $R^2 = .04$ and $r(195) = -.23$, $p < .01$, $R^2 = .04$, respectively.

TABLE XV
CORRELATIONS, MEAN, AND STANDARD DEVIATIONS FOR PATH MEASURES

Variable	Challenge	Threat	CHLC	IHLC	PHLC	Conflict	Cohesion	Expressive	Length	Depression	Anxiety
Challenge	−										
Threat	-.58**	−									
CHLC	-.40**	.45**	−								
IHLC	.42**	-.31**	-.40**	−							
PHLC	-.11	.15*	.09	.04	−						
Conflict	-.29**	.27**	.16*	-.12	.12	−					
Cohesion	.24**	-.30**	-.19*	.14	.12	.45**	−				
Expressive	.20**	.27**	-.20**	.03	-.05	-.35**	.61**	−			
Length	.05	-.07	.01	-.01	-.03	.03	-.02	-.06	−		
Depression	-.30**	.40**	.24**	-.08	.09	.35**	-.36**	-.34**	.06	−	
Anxiety	-.35**	.51**	.29**	-.08	.13	.29**	.19**	-.23**	.00	.72**	−
M	1.37	-0.63	-0.76	0.67	-0.30	-1.94	3.67	1.05	0.00	-3.18	-3.13
SD	1.58	1.91	1.20	1.51	1.43	1.86	2.21	1.53	1.00	2.51	2.45

Note. Expressive = Family expressiveness. Length = Length of illness.

p < .05. **p* < .01

Based on the results of the correlation analyses in conjunction with the Rasch analyses,
the path analysis utilized a revised version of the theoretical model (refer to Figure 3). The main
revision was the removal of the variable for social support due to the absence of an optimized
measure of the construct. With 50 parameters to be estimated and 55 degrees of freedom, the
model was over-identified.
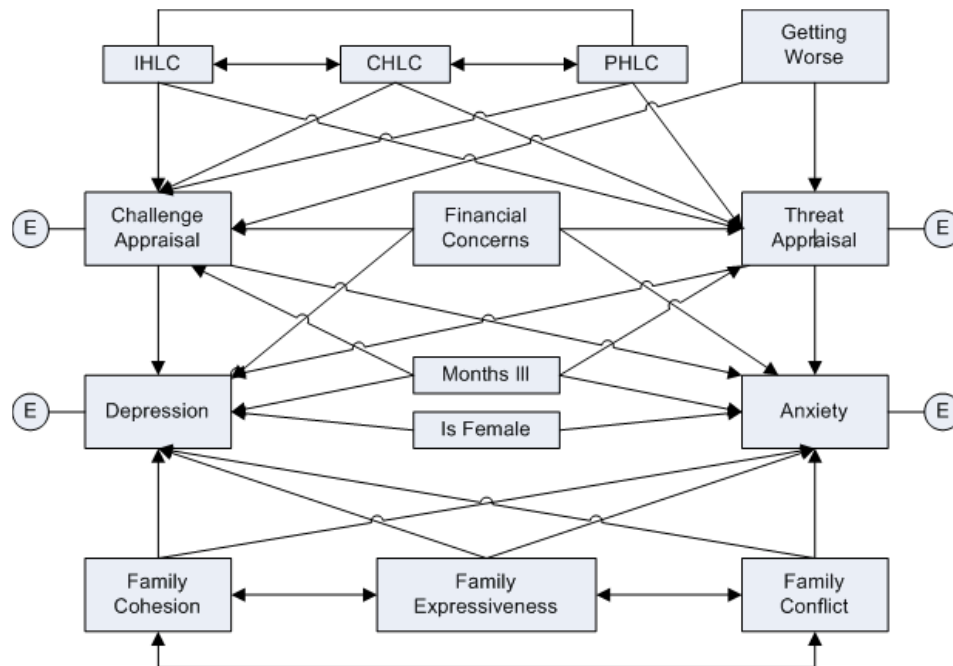
Figure 3. Initial path model tested in AMOS.

The resultant model produced a statistically significant chi-square statistic, $\chi^2(55, n = 196) = 137.24$, $p < .05$, suggesting that the model fit was poor. As shown in Table XVI, the magnitude of the other comparative fit statistics also suggested that the model fit was very poor (NFI = .45, CFI = .48). However, these statistics tend to underestimate model fit with small samples (Blunch, 2008; Tabachnick & Fidell, 2007). The magnitude of the absolute fit statistics such as the GFI suggested that the fit was better, but the parsimony-adjusted index did not meet the lower limit for a good fit (GFI = .90, AGFI = .81).

TABLE XVI

FIT STATISTICS FOR ALTERNATIVE PATH MODELS

Model	df	$\chi^2(n = 196)$	GFI	AGFI	NFI	CFI	RMSEA	AIC	BIC
1	55	137.24*	.90	.81	.45	.48	.09	237.24	401.14
2	28	112.00*	.90	.75	.35	.28	.12	188.00	312.57
3	22	97.41*	.90	.75	.34	.32	.13	163.41	271.58
4	21	78.45*	.92	.79	.50	.48	.12	146.45	257.91
5	20	26.52	.97	.93	.83	.94	.04	96.52	211.25

Note. 1 = Initial model. 2 = Family variables removed. 3 = Gender removed. 4 = Covariance added between the error terms for the appraisal variables. 5 = Covariance added between the error terms for the adjustment variables.
*$p \leq .05$

Following the test of the initial model, there were analyses of several modified models. The first modification was the removal of the family variables to focus the model on the interactions between the illness antecedents (such as demographics), appraisal, and adjustment.

With the family variables removed, the model still produced a significant chi-square statistic, $\chi^2(28, n = 196) = 112.00, p < .05$. The magnitude of the other fit statistics also suggested that the model fit had worsened (refer to Table XVI). The next modification was the removal of the variable for gender due primarily to the small number of male caregivers in the dataset ($n = 16$, 8.16%). This model also produced a significant chi-square statistic, $\chi^2(17, n = 196) = 96.01, p < .05$. The magnitude of the other fit statistics also suggested that the model fit had worsened (refer to Table XVI).

Next there was a modification to investigate the impact of adding a covariance between the error terms of the appraisal measures. While modification indices suggested by AMOS were the primary basis for this addition, there was also some theoretical support for this modification, given the interrelatedness between challenge and threat appraisal (Lazarus & Folkman, 1984). Like the initial model, the modified model also produced a significant chi-square statistic, $\chi^2(21, n = 196) = 78.45, p < .05$. However, the modification also produced slight increases in the other fit statistics (shown in Table XVI), suggesting a minor improvement in the fit. A similar modification was performed for the error terms of the adjustment measures. Unlike the preceding models, this model produced a statistically significant chi-square statistic, $\chi^2(20, n = 196) = 26.52, p = .05$. The other values of the statistics also reflected the improvement in the model fit. This final model is shown in Figure 4, and the corresponding path coefficients are also shown in Table XVII.
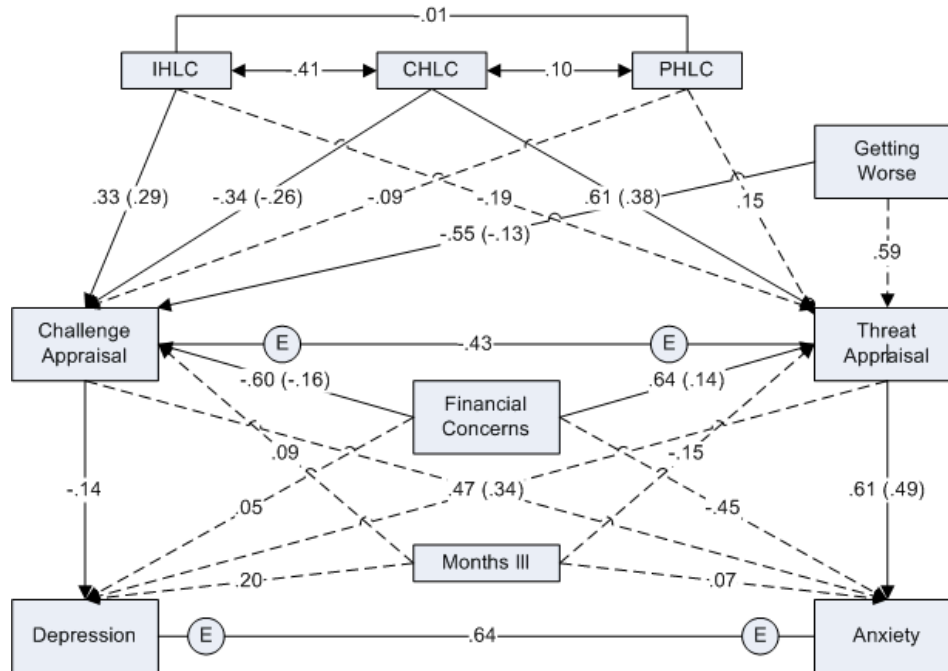
Figure 4. Path model showing the regression coefficients. Parentheses enclose the standardized estimates. Dashed lines indicate relationships that were not statistically significant.

Of the locus of control variables, only the chance locus and internal locus influenced appraisal. A higher chance locus predicted a lower challenge locus and a higher threat appraisal (unstandardized coefficient = -0.34, p < .001 and unstandardized coefficient = 0.60, p < .001, respectively). In contrast, a higher internal orientation predicted a higher challenge appraisal (unstandardized coefficient = 0.33, p < .001), but it was not a significant predictor of threat appraisal (unstandardized coefficient = -0.19, p > .05). The powerful other locus was a not

significant predictor of either challenge or threat appraisal (unstandardized coefficient = -0.09, p

> .05 and unstandardized coefficient = 0.15, p > .05, respectively). Among the locus of control

variables, the strongest relationship was between the chance locus and threat appraisal

(standardized coefficient = .38). This relationship was also the second strongest relationship in

the overall model.

Only one of the illness parameters influenced appraisal. A perceived worsening of the

illness predicted a lower challenge appraisal (unstandardized coefficient = -0.55, p = .05).

However, it was not a significant predictor of threat appraisal (unstandardized coefficient = 0.59,

p > .05). The length of the illness was not a significant predictor of either type of appraisal

(unstandardized coefficient = .09, p > .05 for challenge; unstandardized coefficient = -.15, p >

.05 for threat). However, having concerns about the financial demands of the illness influenced

both types of appraisal. The presence of concerns predicted a lower challenge appraisal and a

higher threat appraisal (unstandardized coefficient = -.60, p < .05 and unstandardized coefficient

= .64, p < .05, respectively).

In terms of direct effects on adjustment, neither the length of the illness nor having

concerns about the financial demands of the illness influenced depression or anxiety

(unstandardized coefficient = -0.09, p > .05 for length on depression; unstandardized coefficient

= -0.15, p > .05 for length on anxiety; unstandardized coefficient = -0.05, p > .05 for concerns on

depression; unstandardized coefficient = -0.45, p > .05 for concerns on anxiety). Nor did

challenge appraisal have a significant influence on depression or anxiety (unstandardized

coefficient = -0.14, $p > .05$ and unstandardized coefficient = -0.13, $p > .05$, respectively).

However, threat appraisal was a significant predictor of both depression and anxiety

(unstandardized coefficient = 0.61, $p < .001$ and unstandardized coefficient = 0.47, $p < .001$,

respectively). Based on the standardized regression coefficients, the influence of threat appraisal

on anxiety was the strongest relationship in the model (standardized coefficient = .49), and the

influence of threat appraisal on depression was the third strongest relationship (standardized

coefficient = .36). Collectively, all of the predictors accounted for less than a quarter of the

variance in depression (17.1%) and but slightly more than a quarter of the variance in anxiety

(28.3%).

TABLE XVII
REGRESSION COEFFICIENTS FOR THE FINAL PATH MODEL

Effect	Unstandardized	Standard Error	Standardized
CHLC on threat appraisal	.61***	.11	.38
CHLC on challenge appraisal	-.34***	.09	-.26
IHLC on challenge appraisal	.33***	.09	.29
IHLC on threat appraisal	-.19	.10	
PHLC on challenge appraisal	-.09	.07	
PHLC on threat appraisal	.15	.08	
Financial concerns on challenge appraisal	-.60**	.23	-.16
Financial concerns on threat appraisal	.64*	.28	.14
Worsening of illness on challenge appraisal	-.55*	.27	-.13
Worsening of illness on threat appraisal	.59	.33	
Illness length on challenge appraisal	.09	.10	
Illness length on threat appraisal	-.15	.12	

Effect	Unstandardized	Standard Error	Standardized
Challenge appraisal on depression	-.14	.13	
Threat appraisal on anxiety	.61***	.10	.49
Financial concerns on depression	.05	.40	
Financial concerns on anxiety	-.45	.36	
Illness length on depression	.20	.17	
Illness length on anxiety	.07	.15	
Challenge appraisal on anxiety	-.13	.12	
Threat appraisal on depression	.47***	.11	.34

p < .05. **p* < .01. ***p* < .001.

V.   DISCUSSION

The diversity of illnesses represented among the caregivers in the study highlights the breadth of chronic conditions that apply to both human and pet contexts and have similar symptoms and treatment regimens. Moreover, the prevailing view among the caregivers that their pets are family members supports using an ecological perspective to identify factors that influence adjustment to these illnesses. This finding also echoes literature on adjustment to human illness that shows that chronic illness affects not only the person who has the illness but also his or her family members and companions (Kazak, 1992; Moos & Schaeffer, 1984; Patterson, 1988; Thompson & Gustafson, 1996). Based on the relatively low proportion of male caregivers in the present study, which also parallels literature reporting the prevalence of female caregivers in the contexts of managing human illness (Coffey, 2006; Thompson & Gustafson, 1996) and caring for pets (AVMA, 2007), the findings also imply that females may be foremost in experiencing the psychosocial effects of the family member's illness.

Like several of the demographic variables reflected in the research question about relationships among caregiver characteristics, gender seemed to play only a minor role in social-environmental differences among the caregivers. There were no significant differences between male and female caregivers in terms of challenge or threat appraisal, family functioning, or levels of depression or anxiety. Nor were there significant differences in the caregiver's chance locus of control or powerful other locus of control on the basis of gender. However, the internal locus of male caregivers was significantly higher than the internal locus of female caregivers. This

157

finding, which implies that male caregivers have a stronger belief about having control over their pet's illness, was unexpected. The initial supposition was that females would have a stronger internal locus given research that suggests that females bear much of the burden of caregiving for children who have a chronic illness (Coffey, 2006; Thompson & Gustafson, 1996) and parallels in demographic data that suggests that females account for a much larger proportion of caregivers of pets than males do (AVMA, 2007). However, the low proportion of male caregivers in the present study could have influenced the unexpected finding. There may also be other factors that mediate a potential connection between assuming a greater a sense of responsibility for a pet's care and beliefs about controlling the course of the pet's illness.

Regarding the caregiver's family status, there were no significant differences in cognitive appraisal or locus of control between caregivers who were married versus nonmarried. Nor were there significant differences in anxiety on the basis of the caregiver's marital status. However, married caregivers exhibited lower levels of depression than nonmarried caregivers did. The presence of children in the household did not show an effect on symptoms of either depression or anxiety among the caregivers. Nor did this demographic characteristic show an association with the caregiver's appraisal of the illness or his or her locus of control.

In contrast to the lack of association that these demographics as well as the caregiver's age and education had with the social-environmental factors examined in the study, there was a significant correlation between both depression and anxiety and the caregiver's concerns about the financial demands of the illness. Greater concerns tended to predict higher levels of

depression and anxiety. However, there was no interaction between depression or anxiety and whether the caregiver had veterinary insurance. Neither was a correlation between depression or anxiety and the length of the pet's illness. Expectedly there was an interaction between depression and anxiety and the caregiver's perceptions of the course of the illness. Both depression and anxiety were significantly higher for caregivers whose pet's illness was getting worse, compared to the adjustment of caregivers whose pet's illness was stable or in remission. One of the implications of these findings is that caregivers may need additional financial and emotional supports as their pet's condition worsens.

The results of the path analysis for the research question about how factors in the model contributed to caregiver adjustment provided mixed support for the hypothesized relationships. For example, the mixed results related to expectancies suggest that they played a lesser role in adjustment than originally predicted. One speculation was that a stronger challenge appraisal would mitigate depression and anxiety as the caregiver had greater efficacy in his or her ability to manage the illness and overcome associated stressors. However, the lack of a direct relationship between challenge appraisal and the adjustment outcomes did not support this supposition. One of the potential reasons for the lack of a direct effect is that coping methods may mediate the relationship. For example, literature suggests that a high challenge appraisal may prompt the use of particular coping strategies such as problem solving which could then alleviate the symptoms of depression and anxiety (Lazarus & Folkman, 1984).

Measurement issues highlighted by the Rasch analysis could also be a factor in the mixed results. Among the items that measured challenge appraisal, there were two items that suggested the need for follow-up investigation. The results for the item that targeted the caregiver's eagerness to the tackle the illness suggests a need to re-examine whether an alternative indicator such as readiness would have functioned more closely with the other items that measured challenge appraisal. The other challenge item that exhibited misfit suggests a need to disentangle potential confounds between the caregivers' efficacy for managing the illness and his or her efficacy for maintaining a positive relationship with the pet's veterinarian.

In contrast to the results for challenge appraisal, the results pertaining to the connections between threat appraisal and psychological adjustment were consistent with predictions. Threat appraisal had the strongest influence on adjustment among the predictors included in the model. Caregivers who had higher threat appraisals tended to have higher symptoms of depression and anxiety. One of the implications of this finding is that caregivers who anticipate the illness having a major negative impact on their lives could be at greater risk for clinical anxiety. Identifying factors that could intercede in this effect could be especially helpful for providing support resources to help caregivers deal with the psychological aspects of the illness.

Similar to the findings on appraisal, the findings related to illness locus of control were also mixed in terms of supporting the theorized relationships in the model. Only two of the three orientations influenced either type of appraisal. Caregivers who had a stronger internal locus of control tended to have a stronger challenge appraisal. This finding suggests that caregivers who

make internal attributions about the control of their pet's illness tend to have greater efficacy for being able to overcome the ramifications of the illness. Based on literature on the connection between locus of control, cognitive appraisal, and adjustment in the context of human illness, one of implications is that these caregivers could be more likely to use particular types of coping strategies, such as problem-focused methods, which could subsequently foster positive adjustment (Lazarus & Folkman, 1984; Thompson, Gil et al., 1993a, 1993b; Wallston, 2001). On the other hand, a stronger internal locus of control did not have a significant influence on threat appraisal. This finding suggests that caregivers who have a strong challenge appraisal and are efficacious about their ability to manage the illness may not strongly perceive the negative implications of the illness.

In contrast to the internal locus, the chance locus influenced both challenge and threat appraisal. Having a relatively stronger chance orientation predicted both a higher threat appraisal and a lower challenge appraisal. Thus, caregivers who believed that external factors such as luck or fate were the primary agents in the course of their pet's illness would likely perceive the illness to pose a greater threat. These caregivers would also have lower efficacy for their ability to deal with the ramifications of the threat, as suggested by the lower challenge appraisal. The other external locus (powerful other) was expected to have a similar influence on appraisal, but the findings did not support this hypothesis. Based on the results of the Rasch analysis, though, more work is needed to better define what the powerful other locus means in the veterinary context. There is also a need for additional research to disentangle potential

confounds between this locus of control and the caregiver's relationship with veterinary personnel.

The results of the Rasch analysis of the locus of control scales also suggested the need for item revisions and follow-up investigations of the items that exhibited high misfit. For example, anecdotal evidence suggested that the reference to the pet's health improving may have generated different interpretations of the items that referenced the improvement, recovery, or worsening of the illness. For example, some caregivers may have considered an improvement to be a lack of complications, whereas other caregivers may have interpreted it as the elimination of symptoms of the illness. Similarly there may have been different perspectives on what *recovering* from a chronic illness means which may have contributed to the misfit of the corresponding items in the scale that measured the powerful other locus. Some caregivers may have regarded recovery in a literal sense whereas others may have viewed it as being in remission or experiencing a reduction of symptoms given that chronic illnesses have no known cure. Likewise, different interpretations of the wording of the item that referenced the caregiver's role in the potential worsening of the pet's condition may have been a factor in the high misfit of this item that measured internal locus of control. Conducting semi-structured interviews or focus groups with a cross-section of caregivers could yield additional insight into these nuances to help refine future research instruments and increase their measurement sensitivity.

These findings could also imply a potential need to distinguish between *health* locus of control and *illness* locus of control. For example, beliefs about control over a pet's general health may differ from beliefs about control over the illness, especially given that chronic illnesses are incurable. Thus, a caregiver who believes that he or she is the primary agent in controlling his or her pet's general condition may still perceive a lack of control over being able to eliminate the illness. This issue may underlie some of the misfit found in the items measuring internal locus of control. Variations in the outward manifestations of symptoms of various types of illnesses could also interact with either conceptualization of control and thereby moderate the influence on appraisal.

In terms of the illness parameters, there was an expectation that both the course and the length of the illness would influence appraisal. Specifically, a perceived worsening of the illness was expected to predict a higher threat appraisal. However, the results of the path analysis did not fully support this supposition. A perceived worsening of the illness did not predict threat appraisal but did predict a lower challenge appraisal. The implication of this finding is that the worsening of the illness detracts from the caregiver's expectancies for being able to cope with the illness. Nonetheless, it does not necessarily increase a sense of impending loss or harm as is characteristic of threat appraisal (Lazarus & Folkman, 1984).

Nor did the length of the illness have an effect on either appraisal or adjustment. This finding countered the expectation that caregivers who had been managing the illness for longer periods would have greater challenge appraisals and lower threat appraisals than caregivers who

had recently begun managing the illness would have. The finding was also counter to the

expectation that the length of the illness might mitigate the caregiver's depression and anxiety.

On one hand, the absence of an effect could suggest that adjustment may not be as temporally

sensitive as initially thought. It may also suggest that adjustment does not get easier over time,

which is somewhat consistent with longitudinal and development studies that have examined

changes in adjustment to human illness over time (Thompson & Gustafson, 1996). However, the

presence of other interpersonal or intrapersonal factors may also mask or suppress the potential

influence of time. It is also possible that time may play a larger role in a broader range of

adjustment outcomes beyond the scope of depression and anxiety examined in the present study.

Another factor that did not influence adjustment as expected was the presence of

concerns about the financial demands of the illness. The supposition was that having concerns

about the financial demands of the illness would predict greater levels of depression and anxiety.

Although financial concerns had an indirect effect on adjustment through appraisal, the results of

the path analysis did not corroborate the theorized direct effect. Within the model, having

concerns about the financial demands of the illness did not significantly predict higher levels of

depression or anxiety. This finding was somewhat unexpected due to anecdotal reports by

several caregivers that financial demands were one of the most stressful aspects of managing a

pet's illness. This incongruity could suggest that these types of stressors may have an impact on

situational stress levels without manifesting themselves in depressive symptoms or indicators of

anxiety. The influence of financial concerns also supports this theory given the contribution of

financial concerns to both threat and challenge appraisal. This finding suggests that caregivers who are concerned about the financial demands of the illness perceive the illness to pose a greater risk for harm or loss. Moreover, these concerns may lessen the caregivers' efficacy about their ability to manage this stress. Follow-up research is necessary for investigating the role that various sources of stress, such as financial demands, play in the adjustment process. This understanding may be especially critical in cases where caregivers must confront difficult choices such as paying for veterinary care or paying for regular living expenses.

The results of the analysis for the research question about how well the model accounted for the variance in adjustment outcomes also imply a need to consider additional factors in the adjustment process. While the model accounted for slightly more than a quarter of the variance in anxiety, the proportion was much lower for depression. Adding factors that were excluded from the analyses may improve how well the model explained adjustment outcomes. For example, coping strategies are a construct that is likely to have a direct effect on adjustment. The inclusion of coping strategies in the empirical model may have explained a considerably greater proportion of variance in depression and anxiety. Similarly, the addition of other factors that are likely to influence either appraisal or adjustment in the empirical model would likely result in incremental increases in the proportion of explained variance. However, the additional parameters also increases the complexity of the model, requiring much larger sample sizes for analysis and making interpretation much more challenging (Tabachnick & Fidell, 2007). The

addition of other constructs also necessarily adds to the information demands placed on the participants. These tradeoffs were among the considerations weighed in the present study.

A.   <u>Limitations</u>

One set of potential factors in the mixed results of the path analysis, as well as the low proportion of variance in adjustment outcomes explained by the model, stems from the limitations of the study. In addition to the nature of path analysis limiting the ability to make causal inferences, the primary measurement-related limitation is the influence of measurement error on the exogenous variables in the path analysis (Kline, 2005). The consequences of this condition are potentially biased estimates of the direct effects in the model. While the Rasch analysis provides a means of optimizing the measures and obtaining more precise estimates of reliability (Bond & Fox, 2001; Elliott et al., 2006; Linacre, 2013; Wolfe & Smith, 2007a, 2007b), the magnitude of the estimates obtained in the present study reinforces that the assumption of error-free measurement is untenable. A larger sample size would help address this limitation by enabling the simultaneous analysis of both the measurement model and latent variables using SEM. There is also a need for cross-validation to provide additional, independent evidence of the strength of the relationships in the model, especially considering the modifications made during the path analysis (Tabachnick & Fidell, 2007).

Another measurement-related limitation pertains to the deletion of missing data. Unlike Rasch analysis, which does not require complete data (Linacre, 2013), SEM is much more sensitive to the influence of missing data (Byrne, 2010; Kline, 2005; Tabachnick & Fidell, 2007).

The removal of incomplete cases from the SEM analysis reduced statistical power and potentially influenced the magnitude of the standard errors of the parameter estimates. Although missing data was generally minimal across the scales after the initial data screening and did not exhibit obvious patterns in the data, the parameter estimates may be influenced by the tenability of the assumption that the missing values were missing at random (Kline, 2005; Tabachnick & Fidell, 2007). Replications of the analysis with additional samples, as well as follow-up comparisons of parameter estimates using widely accepted methods of handling missing data could help address this limitation.

While the size of the sample posed measurement limitations, the composition of the sample may have also posed methodological considerations. Participant recruitment targeted a large geographic area to encourage a sample that was representative of the population of pet caregivers managing a variety of chronic illnesses. However, the recruitment methods may have introduced a potential interaction with selection as the recruitment methods targeted caregivers who were more actively managing their pet's illness (e.g., visiting a veterinary medical facility or using a social networking site focused on the illness). These individuals may have already had strong support structures in place, thereby putting them at less risk for clinical depression and anxiety. Thus, the sample may not have been representative of caregivers who are less active in managing their pet's illness, and this population could be characteristically different in terms of both their appraisal of the illness and their adjustment to it.

Another methodological limitation of the study pertains to the cross-sectional design. Since this method focuses on appraisal and adjustment at a particular point in time, it does not fully address the *process* nature of coping or adjustment. Based on literature on adjustment to human illness, adjustment outcomes and the processes leading up to them are dynamic (Berge & Patterson, 2004; Herbert & Cohen, 1996; La Greca & Schuman, 1995; Leventhal et al., 2004; Moos & Schaefer, 1984; Patterson, 1988, 1989; Rolland, 1984; Seiffge-Krenke, 2001; Stanton et al, 2001; Thompson, Gil et al., 1994; Thompson & Gustafson, 1996). The parallel implication for research on adjustment to a pet's illness is that the caregiver's appraisal of the illness, his or her application of coping strategies, and feedback provided internally and externally about the effectiveness of those strategies can change over time. As these changes occur and the caregiver adapts to them, they may also influence the caregiver's overall adjustment at a given time. Including a variable for the length of the illness provided a means of controlling for some of the differences related to time but does not fully capture the dynamic aspects of the processes of appraisal and adjustment. Applying a longitudinal design and incorporating qualitative methods such as phenomenology in future research could help uncover some of these dynamics.

Another potential limitation pertains to the breadth of illnesses represented among the caregivers and the noncategorical nature of the model. In contrast to categorical models, which focus on how people adapt to specific illnesses, noncategorical models describe adjustment across a wide array of illnesses (Berge et al., 2006; Hocking & Lochman, 2005; Kazak, 1992; Rolland, 1987; Stein & Jessop, 1982; Thompson & Gustafson, 1996; Wallander & Thompson,

1995; Wallander & Varni, 1992). One of the benefits of this approach is that it enables

exploration of commonalities across various chronic illnesses that may influence adjustment in

similar ways or have similar outcomes. For the present study, a noncategorical approach

provided a means of exploring adjustment to a wide range of illnesses in a relatively new

research area. However, the noncategorical nature of the model may also have underestimated

the impact of illness-specific factors. For example, some illnesses have more intrusive or high-

stakes treatment regimens that may be prone to influence coping and adjustment in unique ways.

Although illness-specific factors have not generally accounted for a substantial proportion of

variance in studies conducted on the transactional model (Thompson, Gil et al., 1993a, 1993b;

Thompson & Gustafson, 1996; Thompson, Gustafson et al., 1992b), Thompson and Gustafson

(1996) have recommended a hybrid approach that can leverage the common aspects across

illnesses while simultaneously considering illness-specific aspects. Also, the novelty of the pet

context may introduce unique contributions of certain illness characteristics to adjustment

processes and outcomes. A hybrid illness-specific/categorical approach may be necessary to

fully explore the impact of illness factors above and beyond the generic illness factors included

in the present model. Developing a typology of veterinary illnesses using the work of Rolland

(1984, 1987) as a foundation may help facilitate this effort. Related to this point, additional

research is also be needed to examine what aspects of specific illnesses and/or aspects of the

treatment regimen are most stressful for caregivers.   This line of research could help inform

potential interventions to help provide social, medical, or logistical support for caregivers.

B.   <u>**Future Research**</u>

All of these conceptual, methodological, and measurement-related issues are important considerations for future research to address. Follow-up investigations of the items that showed misfit in the Rasch analyses is a suggested starting point. For example, one of the problematic items that measured challenge appraisal suggests a need to disentangle potential confounds between the caregivers' efficacy for managing the illness and his or her efficacy for maintaining a positive relationship with the pet's veterinarian. Related to this issue, there is also a need to better understand how the caregiver's relationship with veterinary personnel and his or her confidence in their ability to have a positive effect on the illness might influence the caregiver's appraisal of the illness. This notion could also provide insight into the role of veterinary personnel shaping the powerful other orientation of locus of control.

The results of the Rasch analyses also suggests a strong need to redefine what social support means in the context of managing a pet's illness and identify ways to better measure it. While Bronfenbrenner's (1977, 1979) theory of ecology would still be useful for expanding beyond the limits of the family system, as in the transitional model, drawing from the dimensions of social support in the FAAR model may be particularly beneficial for understanding how people in the caregiver's other systems may act as positive or negative sources of support. For example, caregivers may perceive kind words expressed by a coworker about the pet's illness to be positive support, whereas they may perceive judgmental questioning of the caregiver's need to take off from work to care for the pet as negative support. Anecdotal reports by caregivers

suggest that insensitivity by coworkers and other family members regarding the pet's illness can be a significant source of stress. Understanding how these interactions influence the coping process can helpful for both understanding the issues that caregivers face as well as advancing society's understanding and mainstream acceptance of pets as family members.

There are also additional considerations for future research related to process flow and directionality within the model. Like traditional models of adjustment that have generally proposed illness-related factors as inputs to coping processes and adjustment outcomes, the present model considered only a unidirectional path from illness-related factors to appraisal. As Stanton et al. (2001) suggested, though, personal and socioenvironmental factors may also have an impact on the illness context. For example, the physical or social resources that are available to the person may alter his or her perceptions of subjective conditions such as pain. In the pet context it might alter the caregiver's perception of the dog's comfort or quality of life.

Moreover, there are additional conceptualizations of locus of control to explore, even beyond the issues that emerged from the Rasch analysis. As conceptualized in the present study, locus of control reflected outcome expectancies for the pet's illness. A caregiver who has a strong internal illness locus of control would believe that positive and negative aspects of the illness are the results of his or her actions or behaviors, whereas a caregiver who has a strong external locus would believe that external factors (such as other people or fate) play a bigger role in controlling the illness. As Wallston (2001) pointed out, though, there may be a big difference between outcome expectancies and behavioral expectancies in that the person may believe that

he or she has a particular level of internal control but may not think that he or she is capable of demonstrating a particular health-related behavior. Thus, believing that you are responsible for an outcome and being in control of it may not be synonymous. One of the implications for future research is the need for additional information about the caregiver's behavioral expectancies, especially related to specific aspects of the pet's treatment regimen. Another consideration is the role of locus of control as an intermediate outcome of the coping process. In the present model, locus of control was an input to cognitive appraisal. However, Lazarus and Folkman (1984) have also posited how control can play a dual role as both a set of beliefs that influence coping and as a coping strategy.

There are also several other constructs that, if included in the model, may explain greater proportions of variance in the adjustment outcomes and yield additional insight into individual differences in coping processes and outcomes. One of these constructs is personality. Although personality traits were not explicitly included in the transactional model, research conducted on models that include personality have shown that they can play a role in both appraisal of chronic illness and selection of coping strategies among people dealing with illness in human contexts (Costa, Somerfield, & McCrae, 1996; Herbert & Cohen, 1996; Hewitt & Flett, 1996; McCrae & Costa, 2003; Semmer, 2006; Smith & Gallo, 2001; Stanton et al, 2001; Taylor & Aspinwall, 1996). Personality traits also provide a means of capturing intra-individual differences that could account for differences in predisposition to various stress responses (Smith & Gallo, 2001). Literature on pet loss also provides support for the inclusion of personality factors in future

research on caregiver adjustment as they have been one set of the individual-differences factors proposed to account for differences in grief responses (Sharkin & Knox, 2003).

The role of specific illness-related stressors may be another factor that would explain more variance in caregiver adjustment. Moreover, Moos and Schaefer's (1984) framework of illness-related tasks may provide a beneficial starting point for this line of inquiry given the similarities in treat regimens for illnesses that afflict both pets and people. This framework identifies seven sets of adaptive tasks in managing human illness. The first three sets entail dealing with the symptoms of the illness, dealing with the treatment environment, and maintaining relationships with medical personnel. Examples of these types of tasks include coping with bouts of pain, undergoing hospitalization for treatments, and communicating with medical staff about quality of care or concerns about treatment regimens. The other four sets of adaptive tasks, which indirectly relate to the illness, involve maintaining emotional balance, preserving one's self-image and sense of competence, maintaining relationships with other people, and coping with uncertainty. Tasks aimed at emotional balance target negative emotions such as guilt and anger that stem from the illness. Tasks related to self-image involve revising the individual's self-image amid changes in his or her level of functioning or appearance due to the illness. Because the illness may isolate the individual or family from their normal social environment, the tasks involved in sustaining relationships aim to overcome feelings of social isolation and obtain emotional support from other people. The tasks involved in coping with uncertainty relate to dealing with the threat posed by the illness and maintaining a sense of hope.

These tasks have direct parallels in the pet context. For example, just as people who have diabetes must contend with potential spikes in glucose levels and complications such as the development of cataracts, caregivers must contend with these issues among their pets (Fleeman & Rand, 2001; Neuvians & Berger, 2002). Similarly, caregivers whose pets require regular treatment at a veterinary facility must contend with the logistics of these visits and interact with veterinary personnel. At least two of the other four sets of adaptive tasks, which indirectly relate to the illness, are also relevant to the pet context. For example, the first of these two tasks requires that the caregiver balance his or her own emotions and distress in order to prevent the illness from overwhelming him or her. The latter of the two tasks reflects how the caregiver balances the demands of the pet's illness with the need for interaction and meaningful relationship with other people outside of veterinary medical personnel. Hence, the veterinary equivalent of Moos and Schaefer's (1984) illness-related tasks can help illuminate how caregivers perceive their pet's medical needs, manage their physical discomfort, and communicate with veterinary personnel overseeing the pet's treatment.

Also related to other potential stressors that exacerbate the stressfulness of managing chronic illness, non-illness-related sources of stress, such as routine hassles, are another set of factors to consider for future research on caregiver adjustment. In the context of adjustment to human illness, routine hassles are everyday events or situations that often have little impact on overall stress levels when they occur in isolation but can exacerbate an existing stressful situation when they accumulate (Kohn, 1996; Lazarus & Folkman, 1984). In the context of adjustment to

illness, routine hassles do not directly pertain to the illness but can significantly add to an individual's stress level as he or she manages the illness. The implication for caregiver adjustment is that a caregiver's exposure to various routine hassles and his or her perception of the intensity of the hassles may influence both appraisal and adjustment, particularly when there has recently been an accumulation of hassles adding to the caregiver's stress levels.

Another construct that may be particularly productive for helping to illuminate the processes and outcomes of adjustment to chronic illness in pets is the role of personal meaning in shaping appraisal and moderating adjustment outcomes. For example, general literature on adjustment suggests that the meaning that a person ascribes to a stressful situation can play a key role in his or her appraisal of the situation and selection of coping strategies (Lazarus & Folkman, 1984; Park & Folkman, 1997; Patterson, 1988, 1989). Given that challenge appraisal involves recognizing the "potential for gain or growth" (Lazarus & Folkman, 1984, p. 33), one of the implications for the present context is that helping caregivers identify non-negative aspects of the illness could be helpful in fostering positive adjustment. Although chronic illness often evokes negative emotions, the experience can still have positive ramifications even in the context of managing a pet's chronic illness. For instance, anecdotal evidence suggests that the caregiver may feel a stronger emotional bond with the pet and that the caregiving experience may be a major component of the caregiver's personal identity. One of the potential implications for the present context is that caregivers who find positive meaning in their pet's illness might have stronger challenge appraisals. A stronger challenge appraisal may then moderate threat appraisal

which could potentially lower the caregiver's risk for depression. Additional research would help illuminate the meanings that caregivers ascribe to their pet's illness and explore potential associations between meanings, appraisal, and adjustment. Methodologically, incorporating qualitative methods such as phenomenological research could also be particularly beneficial for illuminating the processes of managing a pet's chronic illness and providing insight into the caregiver's appraisal of the illness. For example, one of the advantages of using a phenomenological approach in the context of chronic illness is the capability for elucidating the positive aspects of coping with the illness and broadening conceptualizations of what it means to cope beyond the reduction of stress symptoms (Thomas & Pollio, 2002).

Also related to the role of meaning, another area recommended for future research is the potential for differences in meanings as well as adjustment outcomes among caregivers within different family structures. The concept of global meanings from the FAAR model, which encompasses how family members relate to one another and to the larger community as well as their assumptions about the boundaries of the family (Patterson, 1988), may be particularly beneficial for framing this line of inquiry. Moreover, existing literature on the differential stressfulness of the death of the family pet has suggested that there are differences between the perceptions of husbands and wives (Gage & Holcomb, 1991). Depending on the magnitude of the differences, they could contribute to marital discord and other negative adjustment outcomes such as depression and anxiety. Future research should focus on examining the potential impact of differential attachment among family members on the caregiver's adjustment. Recognizing

that the caregiver is not the only person adapting to the illness, future research should also

consider the family's adaption as a unit of analysis. Examining potential differences among

different family structures may also be helpful for informing the development of new support

structures or family therapy interventions to help support the emotional and psychological needs

of caregivers who might not have strong support structures in place.

Future research should also broaden the scope of adjustment beyond the limited set of

outcome variables in the present study. Similar to the transactional model, the present study

focused on only depression and anxiety as indicators of psychological adjustment. While these

outcomes are important, they do not fully reflect the multidimensional nature of adjustment to

chronic illness (Stanton et al., 2001). Lazarus and Folkman (1984) identified three areas of long-

term adjustment outcomes in the context of general stress and coping: social functioning, morale,

and somatic health. Social functioning refers to the overall effectiveness of the individual's

appraisals of the stressful situation and his or her coping strategies, and morale refers to the

person's overall feelings about him or herself and his or her conditions in life. Health within this

framework refers to the physiological or neurochemical symptoms of illness as well as illness

behaviors, which are actions taken to seek or avoid medical care for symptoms. Extending this

framework to caregiver adjustment, social functioning could represent how well the caregiver's

overall coping strategies align with the illness context and his or her overlapping social roles.

Similarly, morale could reflect the caregiver's general happiness, subjective well-being, and

satisfaction with his or her life. Marital adjustment would be of particular interest based on the

connection between marital accord and caring for a child with a chronic illness (Berge &

Patterson, 2004; Berge, Patterson, & Rueter, 2006; Thomson & Gustafson, 1996). Similar

patterns of decreased marital accord may exist among married caregivers, especially when there

is differential attachment between the pet and each spouse.

It could also be fruitful to expand the notion to health outcomes in the context of the

model of caregiver adjustment to other somatic indicators, such as other scales of the SCL-90-R

that measure physiological stress symptoms. Illness behaviors are also an important component

of health outcomes in Lazarus and Folkman's (1984) health outcomes. In the context of pet

illness, these behaviors would be proxied by the caregiver in managing the pet's care. The

caregiver's compliance with the veterinarian-prescribed treatment regimen, as well as adherence

to it, would be examples of illness behaviors that would be of particular interest. Based on the

FAAR model, in which the treatment regimen is considered to be a demand placed upon the

family from the community system (Patterson, 1988), compliance with treatment regimens, as

well as adherence to them, may be an important indicator of adaptation. Although there is a

general assumption that the treatment regimen will improve the pet's quality of life, complete

adherence to the regimen is not necessarily a certainty in either the human context (La Greca &

Schuman, 1995; Leventhal et al., 2004) or the pet context (AAHA, 2009). There are many

factors such as complexity, cost, and obtrusiveness of the regimen that may influence both

compliance and adherence. Coping processes may also play a direct role in these processes,

especially if the person is in denial about the impact (or even existence) of the illness and

consequently ignores the prescribed regimen. Self-efficacy may also play a role in treatment adherence if the caregiver or person with the illness does not believe that he or she has the ability to carry out the procedures of the regimen. Moreover, locus of control may play a key role in these processes based on the influence that it has been shown to exert on the selection of coping strategies and on adherence to treatment regimens in the context of human illness (Taylor & Aspinwall, 1996; Thompson & Gustafson, 1996). For example, caregivers who have a high internal locus may be more likely to adhere to a complicated treatment regimen than caregivers who have a stronger chance locus may be. These potential influences are important areas for future research to help identify potential barriers to the improving the pet's quality of life.

This connection also implies the importance of considering the feedback loop between the caregiver's adjustment and the pet's adjustment. As with the feedback loop of the transactional model (Thompson, 1985; Thompson & Gustafson, 1996; Wallander & Thompson, 1995), the pet's adjustment is very likely to influence the caregiver's adjustment and coping processes. Thus, a full, comprehensive model of adjustment would include a bidirectional influence between the coping processes and outcomes of the caregiver and the pet. Understanding this connection is especially important for identifying pathways to fostering positive adjustment among both the pet and the caregiver and ultimately for improving the pet's condition.

CITED LITERATURE

American Animal Hospital Association. (2004). *American Animal Hospital Association 2004 Pet Owner Survey*. Retrieved from http://www.aahanet.org/media/graphics/petownersurvey2004.pdf

American Animal Hospital Association. (2009). Compliance: Taking quality care to the next level [Executive summary]. Retrieved from http://www.aahanet.org/protected/ComplianceExecutiveSummary0309.pdf

American Veterinary Medical Association. (2007). *U.S. pet ownership and demographic sourcebook*. Schaumburg, IL: Author.

Bandura, A. (1986). Self-efficacy. In *Social foundations of thought and action: A social cognitive theory* (pp. 390–453). Englewood Cliff, NJ: Prentice-Hall.

Berge, J. M. & Patterson, J. M. (2004). Cystic fibrosis and the family: A review and critique of the literature. *Families, Systems, & Health, 22*, 74–100.

Berge, J. M., Patterson, J. M., & Reuter, M. (2006). Marital satisfaction and mental health of couples with children with chronic health conditions. *Families, Systems, & Health, 24*, 267–285.

Blankfeld, D. F. & Holahan, C. J. (1996). Family support, coping strategies, and depressive symptoms among mothers of children with diabetes. *Journal of Family Psychology, 10*, 173–179.

Blood, D. C., Studdert, V. P., & Gay, C. C. (Eds.). (2007). *Saunders comprehensive veterinary dictionary* (3rd ed.). Edinburgh, London: Elsevier.

Blunch, N. J. (2008). *Introduction to structural equation modeling using SPSS and AMOS*. Los Angeles: Sage Publications.

Bond, T. G. & Fox, C. M. (2001). *Applying the Rasch model: Fundamental measurement in the human sciences*. Mahwah, NJ: Lawrence Erlbaum Associates.

Bowles, D. B., Robson, M. C., Galloway, P. E., & Walker, L. (2010). Owner's perception of carboplatin in conjunction with other palliative treatments for cancer therapy. *Journal of Small Animal Practice, 51*, 104–112.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, 32*, 513–531.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.

Byrne, B. M. (2010) *Structural equation modeling with AMOS:Basic concepts, applications, and programming* (2nd ed.). New York: Routledge.

Cain, A. O. (1985). Pets as family members. In M. B. Sussman (Ed.), *Pets and the family* (pp. 5–10). New York: The Haworth Press.

Cain, A. O. (1991). Pets and the family. *Holistic Nursing Practice, 5*, 58–63.

Carmack, B. J. (1985). The effects on family members and functioning after the death of a pet. In M. B. Sussman (Ed.), *Pets and the family* (pp. 149–161). New York: Haworth Press.

Carnes, S. L. & Quinn, W. H. (2005). Family adaptation to brain injury: Coping and psychological distress. *Families, Systems, & Health, 23*, 186–203.

Catchpole, B., Ristic, J., Fleeman, L., & Davison, L. (2005). Canine diabetes mellitus: Can old dogs teach us new tricks? *Diabetologia, 48*, 1948–1956.

Cerquetella M., Spaterna, A., Laus F., Tesei, B., Rossi, G., Antonelli, E.,… Bassotti, G. (2010). Inflammatory bowel disease in the dog: Differences and similarities with humans. *World Journal of Gastroenterology, 16*, 1050–1056.

Chang, Y., Mellor, D. J., & Anderson, T. J. (2006). Idiopathic epilepsy in dogs: Owners' perspectives on management with phenobaritone and/or potassium bromide. *Journal of Small Animal Practice, 47*, 574–581.

Chipuer, H. M. & Villegas, T. (2001). Comparing the second-order factor structure of the Family Environment Scale across husbands' and wives' perceptions of their family environment. *Family Process, 40*, 187–198.

Cochran, P. E. (1991). *Guide to veterinary medical terminology*. Goleta, CA: American Veterinary Publications.

Coffey, J. S. (2006). Parenting a child with chronic illness: A metasynthesis. *Pediatric Nursing, 32*, 51–59.

Cowles, K. V. (1985). The death of a pet: Human responses to the breaking of the bond. In M. B. Sussman (Ed.), *Pets and the family* (pp. 135–148). New York: Haworth Press.

Derogatis, L. R. (1994). *SCL-90-R: Symptom checklist-90-R: Administration, scoring & procedures manual*. Minneapolis: National Computer Systems.

Derogatis, L. R. & Fitzpatrick, M. (2004). The SCL-90-R, the Brief Symptom Inventory (BSI), and the BSI-18. In M. E. Maruish (Ed.), *The use of psychological testing for treatment planning and outcomes assessment* (pp. 1–41). Mahwah, NJ: Lawrence Erlbaum Associates.

Derogatis, L. R., Lipman, R. S., & Covi, L. (1973). SCL-90: An outpatient psychiatric rating scale–Preliminary report. *Psychopharmacology Bulletin, 9,* 13–28.

Derogatis, L. R. & Wise, T. N. (1989). *Anxiety and depressive disorders in the medical patient.* Washington, DC: American Psychiatric Press.

Dohrenwend, B. P., Dodson, M., Shrout, P. E., & Dohrenwend, B. S. (1984). Symptoms, hassles, social supports, and life events: Problem of confounded measures. *Journal of Abnormal Psychology, 93*, 222–230.

Dohrenwend, B. P. & Shrout, P. E. (1985). "Hassles" in the conceptualization and measurement of life stress variables. A*merican Psychologist, 40*, 780–785.

Duncan, G. J. & Magnuson, K. A. (2003). Off with Hollingshead: Socioeconomic resources, parenting, and child development. In M. H. Bornstein & R. H. Bradley (Eds.), *Socioeconomic status, parenting, and child development* (pp. 83–106). Mahwah, NJ: Lawrence Erlbaum Associates.

Elliott, R., Fox, C. M., Beltyukova, S. A., Stone, G. E., Gunderson, J., & Zhang, X. (2006). Deconstructing therapy outcome measurement with Rasch analysis of a measure of general clinical distress: The Symptom Checklist-90-Revised. *Psychological Assessment, 18*, 359–372.

Favrot, C., Zini, E., Linek, M., & Mueller, R. (2010). Development of a questionnaire to assess the impact of atopic dermatitis on health-related quality of life of affected dogs and their owners. *Veterinary Dermatology. 21*, 63–69.

Fleeman, L. M. & Rand, J. S. (2001). Management of canine diabetes. *The veterinary clinics of North America. Small animal practice. 31*, 855–879.

Folkman, S. & Lazarus, R. S. (1980). An analysis of coping in a middle-aged community sample. *Journal of Health and Social Behavior, 21*, 219–239.

Fuemmeler, B. F., Mullins, L. L., Van Pelt, J., Carpentier, M. Y., & Parkhurst, J. (2005). Posttraumatic stress symptoms and distress among parents of children with cancer. *Children's Health Care, 34*, 289–303.

Gage, M. G. & Holcomb, R. (1991). Couples' perception of stressfulness of death of the family pet. *Family Relations, 40*, 103–105.

Gehlert, S. & Chang, C. H. (1998). Factor structure and dimensionality of the multidimensional health locus of control scales in measuring adults with epilepsy. *Journal of Outcome Measurement, 2*, 173–190.

Gil, K. M., Abrams, M. R., Phillips, G., & Williams, D. A. (1992). Sickle cell disease pain: II. Predicting health care use and activity level at 9-month follow-up. *Journal of Consulting and Clinical Psychology, 60*, 267–273.

Gil, K. M., Williams, D. A., Thompson, R. J., & Kinney, T. R. (1991). Sickle cell disease in children and adolescents: The relation of child and parent pain coping strategies to adjustment. *Journal of Pediatric Psychology, 16*, 643–663.

Haug, M. R. (1977). Measurement in social stratification. *Annual Review of Sociology, 3*, 51–77.

Hauser, R. M., & Warren, J. R. (1997). Socioeconomic indexes for occupations: A review, update, and critique. S*ociological Methodology, 27*, 177–298.

Herbert, T. B. & Cohen, S. (1996). Measurement issues in research and psychosocial stress. In H. B. Kaplan (Ed.), *Psychosocial stress: Perspectives on structure, theory, life-course, and methods* (pp. 295–332). San Diego: Academic Press.

Hocking, M. C. & Lochman, J. E. (2005). Applying the transactional stress and coping model to sickle cell disorder and insulin-dependent diabetes mellitus: Identifying psychosocial variables related to adjustment and intervention. *Clinical Child and Family Psychology Review, 8*, 221–246.

Holm, J. E. & Holroyd, K. A. (1992). The Daily Hassles Scale (Revised): Does it measure stress or symptoms? *Behavioral Assessment, 14*, 465–482.

IBM Corporation (2012a). IBM SPSS Amos (Version 21) [Computer program]. Somers, NY: IBM.

IBM Corporation (2012b). IBM SPSS Statistics (Version 21) [Computer program]. Somers, NY: IBM.

Kahn, C. M. (Ed.). (2007). *The Merck/Merial manual for pet health*. Whitehouse Station, NJ: Merck & Co.

Kanner, A. D., Coyne, J. C., Schaefer, C. & Lazarus, R. S. (1981). Comparison of two modes of stress measurement: Daily hassles and uplifts versus major life events. *Journal of Behavioral Medicine, 4*, 1–39.

Kazak, A. E. (1992). The social context of coping with childhood chronic illness: Family systems and social support. In A. M. La Greca, L. J. Siegel, J. L. Wallander, & C. E. Walker (Eds.), *Stress and coping in child health* (pp. 262–287). New York: Guilford Press.

Kelch-Oliver, K., Smith, C., Diaz, D., & Collins, M. (2007). Individual and family contributions to depressive symptoms in African American children with sickle cell disease. *Journal of Clinical Psychology in Medical Settings, 14*, 376–384.

Kelly, P.A., Kallen, M. A., & Suárez-Almazor, M. E. (2007). A combined-method psychometric analysis recommended modification of the multidimensional health locus of control scales. *Journal of Clinical Epidemiology, 60*, 440–447.

Kohn, P. M. (1996). On coping adaptively with daily hassles. In M. Zeidner & N. S. Endler (Eds.), *Handbook of coping: Theory, research, and applications* (pp. 181–201). New York: John Wiley & Sons.

Kronenberg, W. G. & Thompson, R. J. (1990). Dimensions of family functioning in families with chronically ill children: A higher order factor analysis of the Family Environment Scale. *Journal of Clinical Child and Adolescent Psychology, 19*, 380–388.

La Greca, A. M. & Schuman, W. B. (1995). Adherence to medical regimens. In M. C. Roberts (Ed.), *Handbook of pediatric psychology* (2nd ed., pp. 55–83). New York: Guilford Press.

Lazarus, R. S. & Folkman, S. (1984). S*tress, appraisal, and coping*. New York: Spring Publishing.

Lazarus, R. S., DeLongis, A., Folkman, S., & Gruen, R., (1985). Stress and adaptational outcomes. The problem of confounded measures. *The American Psychologist, 40*, 770–85.

Leventhal, H., Halm, E., Horowitz, C., Leventhal, E. A., & Ozakinci, G. (2004). Living with chronic illness: A contextualized, self-regulation approach. In S. Sutton, A. Baum, & M. Johnston (Eds.), *The Sage handbook of health psychology* (pp. 197–240). London: Sage.

Linacre, J. M. (2004). O*ptimizing rating scale effectiveness.* In E. V. Smith & R. M. Smith (Eds.), *Introduction to Rasch measurement* (pp. 258–278). Maple Grove, MN: JAM Press.

Linacre, J. M. (2013). Winsteps® Rasch Measurement (Version 3.80.0) [Computer software]. Chicago, IL: Winsteps.

Lord, L. K & Podell, M. (1999). Owner perception of the care of long-term phenobarbital-treated epileptic dogs. *The Journal of Small Animal Practice, 40*, 11–15.

Loveland-Cherry, C. J., Youngblut, J. M., & Leidy, N. W. (1989). A psychometric analysis of the Family Environment Scale. *Nursing Research, 38*, 262–266.

Margolies, L. (1999). The long good-bye: Women, companion animals, and maternal loss. C*linical Social Work Journal, 27*, 289–304.

Marsella, R. & Olivry, T. (2003). Animal models of atopic dermatitis. *Clinics in Dermatology, 21*, 122–133.

McCubbin, H., Olson, D., & Larsen, A. (1981). Family Crisis Oriented Personal Evaluation Scales (F-COPES). In H. I. McCubbin, A. I. Thompson, & M. A. McCubbin (Eds.), *Family assessment: Resiliency, coping and adaptation inventories for research and practice* (pp. 455–507). Madison: University of Wisconsin.

Miller, D. (1983). Hollingshead two-factor index of social position. In *Handbook of research design and social measurement* (4th ed., pp. 300–308). New York: Longman.

Moos, R. H. & Moos, B. S. (1983). Clinical applications of the Family Environment Scale. In E. E. Filsinger (Ed.), *Marriage and family assessment: A sourcebook for family therapy* (pp. 253–273). Beverly Hills, CA: Sage.

Moos, R. H. & Moos, B. S. (1994). *Family Environment Scale: Development, applications, research* (3rd ed.). Palo Alto, CA: Consulting Psychologists Press.

Moos, R. H. & Schaefer, J. A. (1984). The crisis of physical illness: An overview and conceptual approach. In R. H. Moos (Ed.), *Coping with physical illness. 2: New perspectives* (pp. 3–25). New York: Plenum Medical Book.

Morse, J. M. (2003). Principles of mixed and multimethod research design. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 189–208). Thousand Oaks, CA: Sage.

Netemeyer, R. G., Bearden, W. O., & Sharma, S. (2003). *Scaling procedures: Issues and applications*. Thousand Oaks, CA: Sage.

Neuvians, T. P. & Berger, M. (2002). Diabetes care in cats and dogs. *Diabetic Medicine. 19*, 77–79.

Park, C. L. & Folkman, S. (1997). Meaning in the context of stress and coping. *Review of General Psychology, 1*(2), 115-144.

Patterson, J. M. (1988). Families experiencing stress. I. The Family Adjustment and Adaptation Response model. II. Applying the FAAR model to health-related issues for intervention and research. *Family Systems Medicine, 6*, 202–237.

Patterson, J. M. (1989). Illness beliefs as a factor in patient-spouse adaptation to treatment for coronary artery disease. *Family Systems Medicine, 7*, 428–442.

Pless, I. B. & Pinkerton, P. (1975). *Chronic childhood disorder–Promoting patterns of adjustment*. London: Henry Kimpton Publishers.

Podell, L. K. (2009). Treatment of status epilepticus. In J. D. Bonagura & D. C. Twedt (Eds.), *Kirk's current veterinary therapy IV* (pp. 1062–1065). St. Louis, MI: Saunders.

Rock, M. & Babinec, P. (2008). Diabetes in people, cats, and dogs: Biomedicine and manifold ontologies. *Medical Anthropology, 27*, 324–352.

Roesch, S. C. & Rowley, A. A. (2005). Evaluating and developing a multidimensional, dispositional measure of appraisal. *Journal of Personality Assessment, 85*, 188–196.

Rolland, J. S. (1984). Toward a psychosocial typology of chronic and life-threatening illness. *Family Systems Medicine, 2*, 245–262.

Rolland, J. S. (1987). Chronic illness and the life cycle: A conceptual framework. F*amily Process, 26*, 203–221.

Schwarzer, C., & Schwarzer, R. (1996). In A critical survey of coping instruments. In In M. Zeidner & N. S. Endler (Eds.), *Handbook of coping: Theory, research, and applications* (pp. 107–132). New York: John Wiley & Sons.

Seiffge-Krenke. I. (2001). *Diabetic adolescents and their families: Stress, coping, and adaptation*. Cambridge, UK: Cambridge University Press.

Semmer, N. K. (2006). Personality, stress, and coping. In M. E. Vollrath (Ed.), Handbook of personality and health (pp. 73–113). West Sussex, England, John Wiley & Sons.

Siegal, M. & Barlough, J. E. (Eds.). (1995). *UC Davis book of dogs: The complete medical reference guide for dogs and puppies.* New York : HarperCollins.

Sharkin, B. S. & Knox, D. (2003). Pet loss: Issues and implications for the psychologist. *Professional Psychology Research and Practice, 34*, 414–421.

Skinner, E. A., Edge, K., Altman, J., & Sherwood, H. (2003). Searching for the structure of coping: A review and critique of category systems for classifying ways of coping. P*sychological Bulletin, 129*, 216–269.

Smith, E. V. (2004a). Detecting and evaluating the impact of multidimensionality using item fit statistics and principal components analysis of residuals. In E. V. Smith & R. M. Smith (Eds.), *Introduction to Rasch measurement* (pp. 575–600). Maple Grove, MN: JAM Press.

Smith, E. V. (2004b). Evidence for the reliability measures and validity measure interpretation: Rasch measurement perspective. In E. V. Smith & R. M. Smith (Eds.), *Introduction to Rasch measurement* (pp. 93–122). Maple Grove, MN: JAM Press.

Smith, E. V. (2010). *An introduction to differential item functioning* [Course materials].

Smith, R. M. (1999). R*asch measurement models: Interpreting WINSTEPS and FACETS output*. Maple Grove, MN: JAM Press.

Smith, R. M. (2004). Fit analysis in latent trait measurement models. In E. V. Smith & R. M. Smith (Eds.), *Introduction to Rasch measurement* (pp. 73 – 92). Maple Grove, MN: JAM Press.

Stanton, A. L., Collins, C. A., & Sworowski, L. A. (2001) Adjustment to chronic illness: Theory and research. In A Baum, T. A. Revenson, & J. E. Singer, (Eds.), *Handbook of health psychology* (pp. 387–403). Mahwah, NJ: Lawrence Erlbaum Associates.

Stein, R. E. K., & Jessop, D. J. (1982). A noncategorical approach to chronic childhood illness. *Public Health Reports, 97*, 354–362.

Stevens, J. P. (2009). *Applied multivariate statistics for the social sciences* (5th ed.). New York: Routledge.

Streiner, D. L. & Norman, G. R. (2008). *Health measurement scales: A practical guide to their development and use* (4th ed.). New York: Oxford University Press.

Tabachnick, B. G. & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston: Pearson Education.

Tarello, W. (2001). Chronic fatigue syndrome (CFS) in 15 dogs and cats with specific biochemical and microbiological anomalies. *Comparative Immunology, Microbiology and Infectious Diseases 24*, 165–185.

Taylor, S. E. & Aspinwall, L. G. (1996). Mediating and moderating processes in psychosocial stress: Appraisal, coping, resistance, and vulnerability. In H. B. Kaplan (Ed.), *Psychosocial stress: Perspectives on structure, theory, life-course, and methods* (pp. 71–110). San Diego: Academic Press.

Thomas, S. P. & Pollio, H. R. (2002). *Listening to patients: A phenomenological approach to nursing research and practice*. New York: Springer.

Thompson, R. J. (1985). Coping with the stress of chronic childhood illness. In A. N. O'Quinn (Ed.), *Management of chronic disorders of childhood* (pp. 11–41). Boston: G.K. Hall Medical Publishers.

Thompson, R. J., Gil, K. M., Abrams, M. R., & Phillips, G. (1992). Stress, coping, and psychological adjustment of adults with sickle cell disease. *Journal of Consulting and Clinical Psychology, 60*, 433–440.

Thompson, R. J., Gil, K. M., Burbach, D. J., Keith, B. R., & Kinney, T. R. (1993a). Psychological adjustment of mothers of children and adolescents with sickle cell disease: The role of stress, coping methods, and family functioning. *Journal of Pediatric Psychology, 18*, 549–559.

Thompson, R. J., Gil, K. M., Burbach, D. J., Keith, B. R., & Kinney, T. R. (1993b). Role of child and maternal processes in the psychological adjustment of children with sickle cell disease. *Journal of Consulting and Clinical Psychology, 61*, 468–474.

Thompson, R. J. Gil, K. E., Gustafson, K. E., George, L. K., Keith, B. R., Spock, A., & Kinney, T. R. (1994). Stability and change in the psychological adjustment of mothers of children and adolescents with cystic fibrosis and sickle cell disease. *Journal of Pediatric Psychology, 19*, 171–188.

Thompson, R. J. & Gustafson, K. E. (1996). *Adaptation to chronic illness*. Washington, DC: American Psychological Association.

Thompson, R. J. Gustafson, K.E., Gil, K. M., Godfrey, J., & Murphy, L. M. (1998). Illness specific patterns of psychological adjustment and cognitive adaptational processes in children with cystic fibrosis and sickle cell disease. *Journal of Clinical Psychology, 54*, 121–128.

Thompson, R. J., Gustafson, K. E., George, L. K., & Spock, A. (1994). Change over a 12-month period in the psychological adjustment of children and adolescents with cystic fibrosis. *Journal of Pediatric Psychology, 19*, 189–203.

Thompson, R. J., Gustafson, K. E., Hamlett, K. W., & Spock, A. (1992a). Psychological adjustment of children with cystic fibrosis: The role of child cognitive processes and maternal adjustment. *Journal of Pediatric Psychology, 17*, 741–755.

Thompson, R. J., Gustafson, K. E., Hamlet, K. W., & Spock, A. (1992b). Stress, coping, and family functioning in the psychological adjustment of mothers of children and adolescents with cystic fibrosis. *Journal of Pediatric Psychology, 17*, 573–585.

Tobin, D. L. (1982). *The assessment of coping: Psychometric development of the coping strategies inventory*. Unpublished master's thesis, Ohio University.

Tobin, D. L., Holroyd, K. A., Reynolds, R. V., & Wigal, J. K. (1989). The hierarchical factor structure of the Coping Strategies Inventory. *Cognitive Therapy and Research, 13*, 343–361.

Toma et al. (Eds.). (1999). *Dictionary of veterinary epidemiology*. Ames, IA: Iowa State University Press.

Toray, T. (2004). The human-animal bond and loss: Providing support for grieving clients. *Journal of Mental Health Counseling, 26*, 244–259.

Turner, W. G. (2001). Our new children: The surrogate role of companion animals in women's lives. *The Qualitative Report, 6*(1). Retrieved from http://www.nova.edu/ssss/QR/QR6-1/turner.html

Veevers, J. E. (1985). The social meanings of pets: Alternative roles for companion animals. In M. B. Sussman (Ed.), *Pets and the family* (pp. 11–30). New York: The Haworth Press.

Vitaliano, P. P., Russo, J., Carr, J. E., Maiuro, R. D., & Becker, J. (1985). The Ways of Coping Checklist: Revision and psychometric properties. *Multivariate Behavioral Research, 20*, 3–26.

Wallander, J. L. & Thompson, R. J. (1995). Psychosocial adjustment of children with physical conditions. In M. C. Roberts (Ed.), *Handbook of pediatric psychology* (2nd ed., pp. 124–141). New York: Guilford Press.

Wallander, J. L. & Varni, J. W. (1992). Adjustment in children with chronic physical disorders: programmatic research on a disability-stress-coping model. In A. M. La Greca, L. J. Siegel, J. L. Wallander, & C. E. Walker (Eds.), *Stress and coping in child health* (pp. 279–298). New York: Guilford Press.

Wallston, K. A. (2001). Conceptualization and operationalization of perceived control. In A. Baum, T. A. Revenson, & J. E. Singer (Eds.), *Handbook of health psychology* (pp. 49–58). London: Sage.

Wallston, B. S., Wallston, K. A., & DeVellis, R. (1978). Development of the Multidimensional Health Locus of Control (MHLC) scales. *Health Education Monographs, 6,* 160–170.

Wheaton, B. (1996). The domains and boundaries of stress concepts. In H. B. Kaplan (Ed.), *Psychosocial stress: Perspectives on structure, theory, life-course, and methods* (pp. 29–70). San Diego: Academic Press.

Wolfe, E. W. & Smith, E. V. (2007a). Instrument development tools and activities for measure validation using Rasch models: Part I–Instrument development tools. In E. V. Smith & R. M. Smith (Eds.), *Rasch measurement: Advanced and specialized applications* (pp. 202–242). Maple Grove, MN: JAM Press.

Wolfe, E. W. & Smith, E. V. (2007b). Instrument development tools and activities for measure validation using Rasch models: Part II–Validation activities. In E. V. Smith & R. M. Smith (Eds.), *Rasch measurement: Advanced and specialized applications* (pp.243–290). Maple Grove, MN: JAM Press.

APPENDIX

Managing a Pet's Chronic Illness

Pet Illness Context Questionnaire

The following questions relate to your pet and your pet's illness and medical treatment.

1. What is your pet?

◯ Cat

◯ Dog

◯ Horse

◯ Other (please specify)

[   ]

2. What is your pet's primary chronic illness? If your pet has more than one chronic illness, select the one that you consider to be the main illness.

◯ Arthritis

◯ Diabetes mellitus

◯ Heart disease

◯ Renal disease

◯ Other (please specify)

[   ]

3. How long ago was your pet diagnosed with this illness?

Year(s) [   ]

Month(s) [   ]

4. What is the general course of your pet's illness?

◯ The symptoms of the illness are getting progressively worse or more severe.
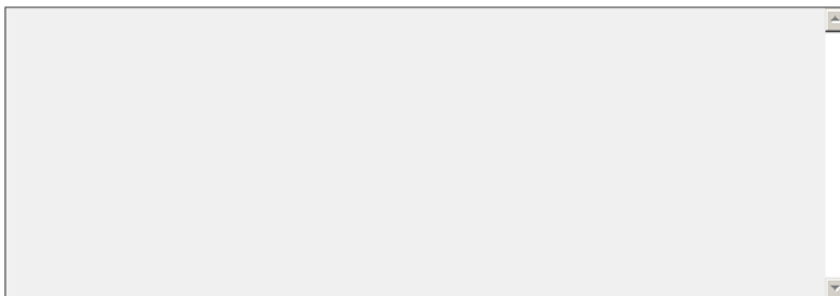
◯ The symptoms of the illness are relatively stable.

◯ The symptoms of the illness are unpredictable.
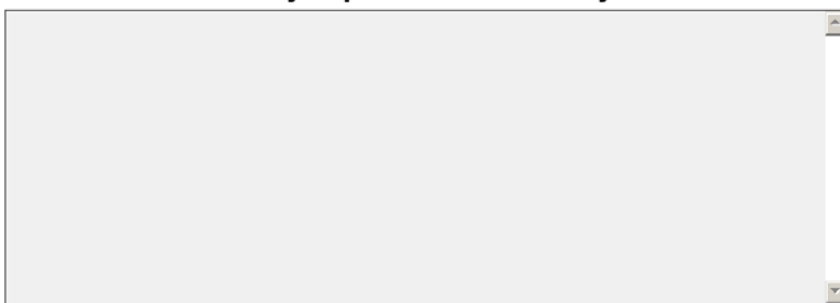
◯ Other (please specify)

[   ]

Managing a Pet's Chronic Illness

5. Please provide a brief description of your pet's treatment regimen.

6. Please describe what your pet's illness means to you.

Managing a Pet's Chronic Illness

Appraisal of Illness Tasks Questionnaire

The following items contain statements about being able to manage various aspects of a pet's illness.

1. For each item, please select the response that best matches your beliefs about the statement.

	Disagree	Tend to Disagree	Tend to Agree	Agree
My pet's illness has serious implications for my life.	○	○	○	○
I have the ability to overcome any stress of my pet's illness.	○	○	○	○
I feel helpless when it comes to managing my pet's illness.	○	○	○	○
My pet's illness is beyond my control.	○	○	○	○
I can become stronger from managing my pet's illness.	○	○	○	○
I am eager to tackle my pet's illness.	○	○	○	○
I have the ability to maintain emotional balance.	○	○	○	○
I feel anxious about the treatment of my pet's illness.	○	○	○	○
I expect positive outcomes from my pet's illness.	○	○	○	○

2. For each item, please select the response that best matches your beliefs about the statement.

	Disagree	Tend to Disagree	Tend to Agree	Agree
I feel anxious about the symptoms of my pet's illness.	○	○	○	○
Managing my pet's illness has a negative impact on me.	○	○	○	○
I have the ability to maintain a positive relationship with my pet's primary veterinarian.	○	○	○	○
I have the ability to manage the symptoms of my pet's illness.	○	○	○	○
I feel helpless when it comes to the treatment of my pet's illness.	○	○	○	○
I have the ability to manage the treatment of my pet's illness.	○	○	○	○
I feel threatened by my pet's illness.	○	○	○	○
I have the skills needed to overcome any stress of my pet's illness.	○	○	○	○
My pet's illness will have long-term consequences on my stress level.	○	○	○	○

Managing a Pet's Chronic Illness

Pet Health Locus of Control

The following items contain statements about having control over a pet's health.

1. For each item, please select the response that is closest to your beliefs about the statement.

	Disagree	Tend to Disagree	Tend to Agree	Agree
It is my behavior that determines whether my pet's health improves.	○	○	○	○
No matter what I do, if my pet is going to get sicker, my pet will get sicker.	○	○	○	○
If I have regular contact with my veterinarian, my pet is less likely to have health problems.	○	○	○	○
Most things that affect my pet's health happen by accident.	○	○	○	○
I can only maintain my pet's health by consulting veterinary professionals.	○	○	○	○
I am in control of my pet's health.	○	○	○	○
Other people play a big part in whether my pet stays healthy or becomes sicker.	○	○	○	○
I am to blame when my pet's condition worsens.	○	○	○	○
Luck plays a big part in determining how soon my pet will recover from the illness.	○	○	○	○

2. For each item, please select the response that is closest to your beliefs about the statement.

	Disagree	Tend to Disagree	Tend to Agree	Agree
Veterinary professionals control my pet's health.	○	○	○	○
My pet's good health is largely a matter of good fortune.	○	○	○	○
The main thing that affects my pet's condition is what I do.	○	○	○	○
If I take care of my pet, the illness will not get worse.	○	○	○	○
The type of care that my pet receives from other people is what is responsible for how well my pet recovers from the illness.	○	○	○	○
No matter what I do, my pet is likely to get sicker.	○	○	○	○
If it's meant to be, my pet will stay healthy.	○	○	○	○
If I take the right actions, my pet can stay healthy.	○	○	○	○
Following the veterinarian's orders to the letter is the best way for me to keep my pet healthy.	○	○	○	○

Managing a Pet's Chronic Illness

Pet Caregiver Family Environment Questionnaire

The following items relate to your family environment.

1. Please select the response that is closest to your beliefs about each statement.

	Disagree	Tend to Disagree	Tend to Agree	Agree
Family members really help and support one another.	◯	◯	◯	◯
We often seem to be killing time at home.	◯	◯	◯	◯
We put a lot of energy into what we do at home.	◯	◯	◯	◯
There is a feeling of togetherness in our family.	◯	◯	◯	◯
We rarely volunteer when something has to be done at home.	◯	◯	◯	◯
Family members really back each other up.	◯	◯	◯	◯
There is very little group spirit in our family.	◯	◯	◯	◯
We really get along well with each other.	◯	◯	◯	◯
There is plenty of time and attention for everyone in our family.	◯	◯	◯	◯
We fight a lot in our family.	◯	◯	◯	◯
Family members rarely become openly angry.	◯	◯	◯	◯
Family members sometimes get so angry that they throw things.	◯	◯	◯	◯
Family members hardly ever lose their tempers.	◯	◯	◯	◯
Family members often criticize each other.	◯	◯	◯	◯

2. Please select the response that is closest to your beliefs about each statement.

	Disagree	Tend to Disagree	Tend to Agree	Agree
Family members sometimes hit each other.	◯	◯	◯	◯
If there's a disagreement in our family, we try hard to smooth things over and keep the peace.	◯	◯	◯	◯
Family members often try to one-up or out-do each other.	◯	◯	◯	◯
In our family, we believe you don't ever get anywhere by raising your voice.	◯	◯	◯	◯
Family members often keep their feelings to themselves.	◯	◯	◯	◯
We say anything we want to around the home.	◯	◯	◯	◯
It's hard to "blow off steam" at home without upsetting somebody.	◯	◯	◯	◯
We tell each other about our personal problems.	◯	◯	◯	◯
If we feel like doing something on the spur of the moment we often just pick up and go.	◯	◯	◯	◯
Someone usually gets upset if you complain in our family.	◯	◯	◯	◯
Money and paying bills is openly talked about in our family.	◯	◯	◯	◯
We are usually careful about what we say to each other.	◯	◯	◯	◯
There are a lot of spontaneous discussions in our family.	◯	◯	◯	◯

Managing a Pet's Chronic Illness

Pet Caregiver Social System Support Questionnaire

The following items are about how you and other people perceive your relationship with your pet.

1. What is your relationship with your pet?

◯ I consider my pet to be a family member.

◯ I consider my pet to be a companion.

◯ I consider my pet to be property.

◯ Other (please specify)

[   ]

2. The following items are about how other people perceive your relationship with your pet. For each of the following statements, please select the response that best reflects what you believe about how other people view your pet.

	Disagree	Tend to Disagree	Tend to Agree	Agree	Not applicable
My family appreciates my relationship with my pet.	◯	◯	◯	◯	◯
My family feels the same way about my pet as I do.	◯	◯	◯	◯	◯
My family cares about my pet's health.	◯	◯	◯	◯	◯
My family cares about my pet's well-being.	◯	◯	◯	◯	◯
My closest friends appreciate my relationship with my pet.	◯	◯	◯	◯	◯
My closest friends care about my pet's health.	◯	◯	◯	◯	◯
My closest friends care about my pet's well-being.	◯	◯	◯	◯	◯
My closest friends think of my pet as a member of my family or as my companion.	◯	◯	◯	◯	◯
My closest friends think of my pet as property.	◯	◯	◯	◯	◯
Most of my coworkers appreciate my relationship with my pet.	◯	◯	◯	◯	◯
Most of my coworkers care about my pet's health.	◯	◯	◯	◯	◯
Most of my coworkers care about my pet's well-being.	◯	◯	◯	◯	◯
Most of my coworkers think of my pet as a member of my family or as my companion.	◯	◯	◯	◯	◯
Most of my coworkers think of my pet as property.	◯	◯	◯	◯	◯

Managing a Pet's Chronic Illness

Brief Symptom Inventory 18

Below is a list of problems people sometimes have. For each problem, please select the response that best describes how much, if any, that problem has distress or bothered you within the past month.

1. Within the past month, this problem has distressed or bothered me...

	Not at all	A little bit	Quite a bit
Faintness or dizziness	○	○	○
Feeling no interest in things	○	○	○
Nervousness or shakiness inside	○	○	○
Pains in heart or chest	○	○	○
Feeling lonely	○	○	○
Feeling tense and keyed up	○	○	○
Nausea or upset stomach	○	○	○
Feeling blue	○	○	○
Suddenly scared for no reason	○	○	○

2. Within the past month, this problem has distressed or bothered me...

	Not at all	A little bit	Quite a bit
Trouble getting your breath	○	○	○
Feelings of worthlessness	○	○	○
Spells of terror and panic	○	○	○
Numbness or tingling in part of your body	○	○	○
Feeling hopeless about the future	○	○	○
Feeling so restless you couldn't sit still	○	○	○
Weakness in parts of your body	○	○	○
Thoughts of ending your life	○	○	○
Feeling fearful	○	○	○

Managing a Pet's Chronic Illness

Demographics Questionnaire

The following questions relate to your demographic characteristics and background information.

1. Do you currently live in the United States?

◯ No

◯ Yes

2. What is your gender?

◯ Male

◯ Female

3. What is your marital status?

◯ Married

◯ Not married

4. Does your household include children who are 16 years of age or younger?

◯ No

◯ Yes

5. What is the highest level of schooling that you have completed?

◯ High school or GED

◯ College or university

◯ Other (please specify)

[   ]

6. What is your age (in years)?

[   ]

7. Do you have insurance that covers at least part of your pet's medical care?

◯ No

◯ Yes

8. To what extent, if any, do you have concerns about being able to pay for your pet's medical care?

◯ No concerns   ◯ Minor concerns   ◯ Major concerns

CURRICULUM VITA

NAME: Melissa A. Kelly

EDUCATION: B.S., Mechanical Engineering, Carnegie-Mellon University, Pittsburgh, PA, 1990

M.Ed., Educational Leadership/Education and Training Management/Instructional Technology, University of West Florida, Pensacola, FL, 2003

Ed.S., Curriculum and Instruction, University of West Florida, Pensacola, FL, 2006

TEACHING: Educational Pyschology Department, University of Illinois at Chicago, Educational Program Evaluation, 2011, 2012, 2013

Educational Pyschology Department, University of Illinois at Chicago, Topics in Educational Psychology, 2012, 2013

Educational Pyschology Department, University of Illinois at Chicago, Assessment in the Urban Elementary Classroom I, 2012

Educational Pyschology Department, University of Illinois at Chicago, Assessment in the Urban Elementary Classroom II, 2013

Educational Pyschology Department, University of Illinois at Chicago, Educational Assessment and Evaluation, 2013, 2014

Educational Pyschology Department, University of Illinois at Chicago, Principles of Learning and Instruction Across the Lifespan, 2014

Educational Pyschology Department, University of Illinois at Chicago, Instructional Design and Training, 2014

PUBLICATIONS: Barry, L. M. & Kelly, M. A. (2006). Rule-governed behavior and self-control in children with ADHD: A theoretical attempt. *Journal of Early and Intensive Behavioral Intervention, 3*(3), 239 – 254.

Brame, T. F., Kelly, M. A., & Kaczynski, D. (2005, July). *Vocational training transition model: Year three summative evaluation*. (Tech.

VITA (continued)

Rep. No. 3). Pensacola, FL: University of West Florida, Office of Juvenile Studies.

Curda, L. K. & Kelly, M. A. (2008). Practical guidelines for development and implementation of learning objects, repositories, and design patterns in higher education contexts. In *Handbook of Research on learning design and learning objects: Issues, applications and technologies*. IGI Global.

Kaczynski, D. & Kelly, M. (2004). Curriculum development for teaching qualitative data analysis online. *Proceedings of the International Conference on Qualitative Research in IT & IT in Qualitative Research*, Brisbane, Australia.

Kaczynski, D., Miller, E., & Kelly, M. A. (2009). *Youth Offender Program Evaluation: Ensuring quality and rigor: A few lessons learned from a national evaluation study*. Available at http://www.uk.sagepub.com/richards/homeP10.htm

Kaczynski, D., Pilcher, J., Kelly, M., & Ryersbach, M. (2006). Perceived barriers to promoting advocacy research among higher education faculty members. *Education and Society, 24*(3), 47 – 60.

Kelly, M. A. (2005, April). *Evaluation report for Bayview Park Dog Park and Scott Complex Dog Park*. Unpublished manuscript.

Kelly, M. A. (2012). *Lawrence Hall: Spring 2012 outcomes evaluation*. Unpublished manuscript.

Kelly, M. A. & Barry, L. M. (2010). Identifying and alleviating the stresses of first-generation college students. In K. M., Collins, A. J., Onwuegbuzie, & Q. G. Jiao (Eds.), *Toward a broader understanding of stress and coping: mixed methods approaches*. Charlotte, NC: Information Age Publishing.

Kelly, M. A. & Kaczynski, D. J. (2007). Misconceptions students bring to qualitative research: Aligning prior conceptions with instructional practice. *Qualitative Research Journal, 6*(2), 31 – 44.

Kelly, M. A. & Kaczynski, D. J. (2008). Teaching evaluation from an experiential framework: Connecting theory and organizational

VITA (continued)

development with grant-making. *American Journal of Evaluation, 29*(4), 547 – 554.

Salmon, D. & Kelly, M. (2008). Exploring what concept maps reveal about knowledge integration in teacher learning. *The International Journal of Learning, 15*(6), 13 – 22.

Salmon, D. & Kelly, M. (2009). Designing meaningful learning environments for teachers: The relationship between representational modes and thinking patterns. *The International Journal of Learning, 16*(8), 447 – 460.

Salmon, D. & Kelly, M. A. (2012). Using concept mapping to enhance teachers' metacognition. *Teaching Educational Psychology, 8*, 1-18.

Sheridan, K. & Kelly, M. A. (2012). Teaching early childhood education students through interactive scenario-based course design. *Journal of Early Childhood Teacher Education, 33*(1), 73 – 84.

Sheridan, K. & Kelly, M. A. (2010). The indicators of instructor presence that are important to students in online courses. *Journal of Online Learning and Teaching, 6*(4), 767 – 779.

Sheridan, K. & Kelly, M. (2007, August). Teaching education students through interactive scenario-based course design. *Proceedings of 23rd Annual Conference on Distance Teaching & Learning*. Madison, WI.

Sheridan, K., Kelly, M. A., & Bentz, D. T. (2012). A follow-up study of the indicators of instructor presence critical to students in online courses. In Z. Akyol & R. Garrison (Eds.), *Educational communities of inquiry: Theoretical framework, research and practice (pp. 67-83)*. Hershey, PA: IGI Global.