



## INTRODUCTION

Research of eating behavior, especially of eating disorders, has traditionally focused on young women in their teens and twenties (Smink, van Hoeken & Hoek, 2012). Recent studies suggest, however, that eating pathology is not confined to young women. A recent study has shown that even women aged 60 or older were unhappy with their weight and body shape, and a small percentage of them fulfilled the criteria of an eating disorder (Mangweth-Matzek et al. 2006). Slevic and Tiggemann (2011) suggested in their review that an increasing number of middle-aged women from highly industrialized countries are practicing disordered eating behaviors.

Yet only little is known about the factors that influence eating behavior in middle-aged women. One factor, which is discussed to be specific to middle-aged women and potentially influencing eating behavior, is menopausal status (Mangweth-Matzek, Hoek, Rupp, Kemmler, Pope & Kinzl, 2013). Menopause is a complex physiological process, during which estrogen production decreases (e.g. Nelson, 2008). Important in this context is that menopause has been found to be associated with fat redistribution, an increase in abdominal fat and, on average, a weight gain of 2 to 2.5 kg over three years (Polotsky & Polotsky, 2010; Wing, Matthews, Kuller, Meilahn & Plantinga, 1991). Despite these findings, only few studies exist about the relationship between menopausal transition and disordered eating behavior. Nor has it been examined whether menopause and the existence of a prior history of disordered eating are associated with current eating behavior of middle-aged women.

Other biological factors that might be associated with eating behavior are hormones. Although research on the hormonal control of food intake has made significant progress within the past decade and a half (e.g. Cummings & Overduin, 2007), the hormones that control food



intake and their associations with the female reproductive axis have predominantly been examined in animal studies (e.g. Brown & Clegg, 2010). While weight dissatisfaction or disordered eating behavior differs among men and women, little is known about the reasons for these differences (Forrester-Knauss & Zemp Stutz, 2012). Therefore, gender specific factors such as the female reproductive axis should be considered in research about disordered eating behavior in women.

Recent research on eating behavior focuses not only on biological factors (e.g. Cummings, Overduin, 2007; Morton, Cummings, Baskin, Barsh & Schwartz, 2006; Valassi, Scacchi & Cavagnini, 2008), or psychological factors only (e.g. Finlayson, King & Blundell, 2007; Striegel-Moore, 1995) but aims to establish associations and correlations between both research fields (e.g. Södersten, Nergardh, Bergh, Zandian & Scheurink, 2008).

In order to examine psychological and biological factors associated with eating behavior, the first goal of this thesis is to examine the psychological aspects of disordered eating behavior in middle-aged women and its relationship to the menopausal status. The second goal is to examine biological aspects of food intake control in middle-aged women around menopause with a special focus on the association between the female reproductive axis and food intake control.

With the purpose of embedding the empirical studies in their theoretical background, and to explain the need for the studies, the first chapter (Part I: Theoretical Background) briefly sets out the concepts of eating behavior, disordered eating behavior, female reproductive axis and menopause, and neuroendocrine control of food intake. Finally, a brief summary of the theories and the study ideas is given in the last part of the theoretical background. In a second chapter (Part II: Empirical Studies), the results of two empirical studies, which were conduct-



ed as part of the present thesis, are presented. The thesis concludes (Part III: General Discussion) with a general discussion of the results and their implications for future studies.



## **Part I: THEORETICAL BACKGROUND**

This thesis investigates psychobiological aspects of eating behavior in middle-aged women. Part I sets out the theoretical background. The first chapter provides an overview of the psychological dimension of eating behavior, which is a part of the much larger scientific field of nutrition psychology. The focus of the second chapter is on the female reproductive axis and menopausal transition. The third chapter gives an overview of the neuroendocrine control of food intake. Finally, the last chapter provides a summary of the theoretical background and describes our study ideas and hypotheses.

### **1 Nutrition Psychology**

The following chapter 1.1 provides a general definition of nutrition psychology in the context of health psychology. Subsequently, chapter 1.2 gives an introduction into eating behavior in general with a special emphasis on disordered eating behavior in middle-aged women.

#### **1.1 Nutrition Psychology as Part of Health Psychology**

People engage in eating behavior as a part of survival. The primary task of our ancestors was to gather any food that would provide sufficient energy and nutrients to survive. Food was a scarce resource. In highly industrialized societies, however, food exists in abundance. Dealing with such unprecedented amounts of food and available food choices has become a challenge, and eating behavior today is highly associated with mood and emotions (Meule & Vögele, 2013; Vögele & Gibson, 2010).



Ever since psychology has aspired to scientifically examine human behavior, our food intake behavior, and the specific challenges presented by an abundance of food choices, have been part of the examination. Psychology started to ask questions such as “Why do we start eating?”, “Why do we stop eating?” and “Why do we eat, what we eat?” (Pudel & Westenhöfer, 2003, p. 20). The increasing interest in human food intake behavior in recent times is a part of the general ambition of health psychology to continuously improve human health (Baum & Posluszny, 1999).

Matarazzo (1982) defined health psychology as the aggregate of specific educational, scientific and professional contributions of the discipline of psychology to the promotion and maintenance of health. More specifically, on the one hand health psychology is concerned with the prevention and treatment of illness, the identification of etiologic and diagnostic correlates of health, illness and related dysfunction (Matarazzo, 1982). On the other hand the analysis and improvement of the health care system and health policy formation is also part of health psychology (Matarazzo, 1982; Johnston, 1994).

Modern health psychology has further specified the above definition. It has adopted a psychological approach to understanding health. Such a holistic approach includes biological, psychological and social processes (Ogden, 2012).

It has long been recognized that eating is an important contributor to health (Committee on Diet and Health, Food and Nutrition Board, 1989). People generally associate eating with good health (Harris & Guten, 1979; Sobal, 1986).

Pudel and Westenhöfer (2003) thus define nutrition psychology as a part of health psychology (p. 27). Therefore, nutrition psychology is a scientific domain of health psychology that fo-



cuses on the implications of eating behavior on human health and illness (Pudel & Westenhöfer, 2003, p. 27). Nutrition psychology also follows a holistic approach, including biological and psychological aspects.

Until the 1980s, academic psychology focused only little on nutrition. The focus was more on disordered eating behavior, especially patients with eating disorder as, e.g., anorexia nervosa (AN) or obesity (Stunkard, 1959). Today, however, nutrition is an essential part of the holistic, i.e. psychobiological, approach to eating behavior (Pudel & Westenhöfer, 2003, p. 27).

#### 1.1.1 Research and Applied Fields of Nutrition Psychology

Nutrition psychology can be grouped into sub-research fields. There are numerous studies in these different fields. One of these fields is epidemiological research, which focuses among other belongings on analyzing food preferences (e.g. Birch, 1999), eating styles (e.g. Braet, Claus, Goossens, Moens, Vlierberghe & Soetens, 2008) and the prevalence, or incidence, of eating disorders or other eating related illnesses (e.g. Smink, van Hoeken & Hoek, 2012). Another field is experimental research and refers to research questions about hunger (e.g. Kirchner, Heppner & Tschöp, 2012) and satiety (e.g. Cummings & Overduin, 2007) and the influences of cognitive and emotional aspects on eating behavior (e.g. Siep, Jansen, Havermans & Roefs, 2011).

The main focus of clinical research, however, is on the pathogenesis of eating disorders and therefore developing implications for therapy in eating disorders (e.g. Brewin, Gregory, Lipton & Burgess, 2010).



A second area of nutrition psychology is the applied field. This field is concerned with policy decisions that could foster positive change in the public's nutrition practices and eating behavior (e.g. Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). Furthermore, it seeks to apply recent scientific findings about nutrition in primary, secondary and tertiary prevention (e.g. Austin, 2000), nutrition consulting (e.g. Eaton, Goodwin & Stange, 2002) and therapy of eating disorders (e.g. Murphy, Straebl, Cooper & Fairburn, 2010).

In summary, nutrition psychology is part of health psychology. Nutrition psychology is divided into many diverse research and applied fields. It mainly focuses on the implications that eating behavior has on human health or illness. Recent research follows a holistic psychobiological approach to eating behavior and health in general.

## **1.2 Eating Behavior**

Eating behavior is a part of nutrition psychology. After a definition of eating behavior in general, this chapter will describe disordered eating behavior in general and, more specifically, disordered eating behavior in middle-aged women.

### **1.2.1 Definition and Description**

Eating behavior is a broad term that encompasses a wide range of eating-related behaviors. It includes food choice and motives, feeding practices, dieting, and disordered eating, including obesity (La Caille, 2013). Eating behavior is influenced simultaneously by personal, social, cultural, environmental and economic factors (Larson & Story, 2009).