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THE DIFFERENCES BETWEEN SELF-REPORTED AND MEASURED HEIGHT AND WEIGHT: DETECTION, EXAMINATION AND MANIPULATION

DOCTOR OF PHILOSOPHY DISSERTATION

NATALIE K. KKELI

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The present doctoral dissertation was submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy of the University of Cyprus. It is a product of original work of my own, unless otherwise mentioned through references, notes, or any other statements.

Natalie K. Kkeli

ABSTRACT [GREEK]

Οι απαντήσεις σε δηλώσεις αυτο-αναφοράς θα πρέπει να περιγράφουν τα χαρακτηριστικά των ερωτηθέντων με ακρίβεια. Η ακρίβεια των αυτο-αναφορών εξετάζεται με τη μέτρηση του βαθμού συμφωνίας τους με τις πραγματικές μετρήσεις, όπου αυτό είναι εφικτό. Προηγούμενες έρευνες εντόπισαν διαφορές μεταξύ αυτο-αναφορών και πραγματικών μετρήσεων ύψους και βάρους. Εντούτοις, τα εμπειρικά ευρήματα είναι ασαφή και οι παράγοντες που σχετίζονται με εσφαλμένες αναφορές έχουν εξεταστεί μεμονωμένα. Η παρούσα διατριβή εξετάζει την ακρίβεια αυτο-αναφορών ύψους και βάρους χρησιμοποιώντας αντιπροσωπευτικά, συμπτωματικά, και κλινικά δείγματα, δευτερογενείς και πρωτογενείς βάσεις δεδομένων, συσχετιστικές και πειραματικές μεθοδολογικές προσεγγίσεις για ολιστική αντιμετώπιση του προβλήματος.

Χρησιμοποιώντας ένα αντιπροσωπευτικό δείγμα ηλικιωμένων από την έρευνα Health and Retirement Study (HRS) στις ΗΠΑ, η πρώτη μελέτη έδειξε ότι κατά μέσο όρο το ύψος υπερεκτιμήθηκε και το βάρος υποεκτιμήθηκε στις αυτο-αναφορές. Οι άντρες υπερεκτίμησαν το ύψος τους περισσότερο από τις γυναίκες, και οι γυναίκες υποεκτίμησαν το βάρος τους περισσότερο από τους άντρες. Βρέθηκε επίσης περισσότερη υπερεκτίμηση του ύψους και λιγότερη υποεκτίμηση του βάρους καθώς τα άτομα μεγαλώνουν ηλικιακά. Χρησιμοποιώντας ένα αντιπροσωπευτικό δείγμα Ολλανδών από την έρευνα Longitudinal Internet Studies for the Social Sciences (LISS) Panel, η δεύτερη μελέτη έδειξε ότι κατά μέσο όρο οι συμμετέχοντες υποεκτίμησαν το βάρος τους. Δεν βρέθηκαν σημαντικές διαφορές φύλου. Τα άτομα με υψηλό Δείκτη Μάζας Σώματος (ΔΜΣ) υποεκτίμησαν το βάρος τους περισσότερο από αυτούς με χαμηλότερο ΔΜΣ, και η υποεκτίμηση του βάρους βρέθηκε να είναι πιο έντονη σε άτομα μεγαλύτερης ηλικίας. Τέλος, βρέθηκε ότι οι συμμετέχοντες δήλωναν με περισσότερη ακρίβεια το βάρος τους αν είχαν προηγηθεί συχνές μετρήσεις του βάρους.

Η τρίτη μελέτη εξέτασε την ακρίβεια των αυτο-αναφορών του ύψους και βάρους σε ενήλικες με διαβήτη τύπου 1 με ή χωρίς διαταραγμένη διατροφική συμπεριφορά. Εξ όσων γνωρίζουμε, η παρούσα μελέτη εξέτασε για πρώτη φορά την ακρίβεια των αυτο-αναφορών ύψους και βάρους σε τέτοιο δείγμα. Κατά μέσο όρο, οι συμμετέχοντες υποεκτίμησαν το ύψος και το βάρος τους. Δεν βρέθηκαν σημαντικές διαφορές μεταξύ των ομάδων και των φύλων. Χρησιμοποιώντας ένα δείγμα γυναικών που είχαν διαγνωστεί με ανορεξία και ανέκτησαν το βάρος τους, και μια ομάδα ελέγχου, η τέταρτη μελέτη έδειξε ότι κατά μέσο όρο οι συμμετέχουσες υπερεκτίμησαν το ύψος και υποεκτίμησαν το βάρος τους. Το κλινικό δείγμα δεν διέφερε σημαντικά από την ομάδα ελέγχου στις αυτο-αναφορές.

Η πέμπτη μελέτη εξέτασε την ακρίβεια των αυτο-αναφορών του ύψους και βάρους με χειρισμό ως προς την πληροφόρηση για επικείμενες μετρήσεις σε ένα δείγμα φοιτητών από δύο τοπικά πανεπιστήμια. Μια ομάδα από το δείγμα ενημερώθηκαν ότι θα ακολουθήσουν μετρήσεις μετά από τις αυτο-αναφορές, ενώ στην άλλη ομάδα δεν ενημερώθηκαν. Το φύλο, η δυσαρέσκεια σώματος, το ρίσκο για διατροφικές διαταραχές, η επιθυμία για κοινωνική αποδοχή, ο φόβος αρνητικής αξιολόγησης, και το πόσο συχνά και πρόσφατα μετρήθηκαν καταγράφηκαν. Αυτή είναι η πρώτη μελέτη που χειρίστηκε τη γνώση των πραγματικών μετρήσεων ελέγχοντας τις συγκεκριμένες μεταβλητές. Η ομάδα που ενημερώθηκε ότι θα πραγματοποιηθούν μετρήσεις ήταν πιο ακριβής στις αυτο-αναφορές του βάρους σε σύγκριση με την ομάδα που δεν ενημερώθηκε. Οι δύο ομάδες δεν διέφεραν στατιστικά σημαντικά στις αυτο-αναφορές του ύψους.

Στα διαφορετικά δείγματα που εξετάστηκαν, βρέθηκαν συγκλίσεις ως προς την ανακρίβεια στις αυτο-αναφορές ύψους και βάρους, με μεγαλύτερα μεγέθη επίδρασης στις αυτο-αναφορές ύψους. Οι ερευνητές και επαγγελματίες υγείας χρειάζεται να λαμβάνουν υπ᾽όψιν τους αυτές τις ανακρίβειες. Συστάσεις ως προς τις προσεγγίσεις που θα μπορούσαν να μειώσουν το σφάλμα αναφοράς γίνονται στη διατριβή. Τα ευρήματα της παρούσας διατριβής θα μπορούσαν να έχουν κλινικές εφαρμογές, καθώς και γενικότερη εφαρμογή στην έρευνα με ερωτηματολόγια αυτο-αναφοράς.

ABSTRACT [ENGLISH]

The answers of respondents in self-reports should describe their characteristics in an accurate way. The accuracy of self-reports is examined by measuring how closely they agree with actual measurements, where these are possible. Previous research has suggested that there are differences between self-reports and measurements of height and weight. Nevertheless, empirical findings are inconclusive and the determinants of misreporting have been examined in isolation. The present dissertation examines the accuracy of self-reports of height and weight using representative, convenience and clinical samples, original data and secondary databases, correlational and experimental approaches for an integrated treatment of the problem.

Using a representative sample of older adults from the Health and Retirement Study (HRS) in the US, Study 1 demonstrated that height was on average overestimated and weight was underestimated in self-reports. Males overestimated their height more than females, and females underestimated their weight more than males. The overestimation of height was found to be larger, and the underestimation of weight to be less pronounced as individuals get older. Using a representative sample of Dutch individuals from the Longitudinal Internet Studies for the Social Sciences (LISS) Panel, Study 2 suggested that on average participants underestimated their weight. No significant gender differences were found. Individuals with higher Body Mass Index (BMI) underestimated their weight more than those with lower BMI, and the underestimation of weight was larger as individuals get older. Lastly, it was found that participants were more accurate reporters of their weight after frequent weighing.

Study 3 examined the accuracy of self-reports of height and weight among adults with type 1 diabetes with and without disordered eating symptomatology. To our knowledge, this is the first study that examined the accuracy of self-reports of height and weight in this sample. On average, participants underestimated their height and weight. No significant group and gender differences were found. Using a sample with females who have been weight-restored from anorexia nervosa and healthy controls, Study 4 suggested that height was on average overestimated and weight was underestimated. The clinical sample did not significantly differ from controls in self-reports.

Study 5 examined the accuracy of self-reports of height and weight by manipulating the awareness of impending actual measurements in a convenience sample of students from two local universities. One group in the sample was informed that measurements would follow after the self-reports, while the other group was not informed. Gender, body dissatisfaction, eating disorder risk, social desirability, fear of negative evaluation, frequency and recency of measurements were recorded. This is the first study that manipulated the awareness of actual measurements controlling for these specific variables. The informed group was more accurate on self-reports of weight compared to the uninformed group. The two groups did not significantly differ in height reporting.

The findings support that self-reports of height and weight are inaccurate in the different samples being examined with larger effect sizes in self-reports of height. Researchers and health professionals need to consider these inaccuracies. Recommendations for approaches that could reduce the reporting error are provided in the dissertation. The findings of the present dissertation could have implications for clinical practice and for research with self-report instruments.

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DEDICATION

To our little fighter,
my nephew Maximos

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Chapter 1

Introduction

Surveys and Errors

The term survey is used to describe a method of gathering information about the characteristics, actions, or opinions of a sample of individuals. One main premise of a survey is to learn something about the target population from which the sample has been drawn (Groves et al., 2004; Pinsonneault & Kraemer, 1993; Scheuren, 2004). Another core premise of a survey is that the answers of the respondents must describe their characteristics in an accurate way (Groves et al., 2004).

The way that we assess that respondents' answers accurately describe their characteristics is by measuring how well they agree with the truth. Respondents' answers consist of two components: the true score, which reflects the respondent's situation, plus some error (Groves et al., 2004). Errors can be random and systematic. A random error can vary across respondents and within a respondent depending on the occasion (Tourangeau, Rips, & Rasinski, 2000). If the error is random, the answers will be erred sometimes in one and sometimes in the other direction due to unknown sources (Groves et al., 2004). A random error is cancelled out over repeated measurements (Boslaugh, 2012). A systematic error reflects the tendency of the respondent to overreport or underreport (Tourangeau et al., 2000). The answers systematically differ from the true score in one direction and may reflect specified situational or individual effects (Althubaiti, 2016; Fowler, 2009).

The present chapter will focus on how respondents answer questions in surveys, the possible errors that are associated with their answers, and the rationale behind their misreporting in surveys.

Survey Response Process

Several models of survey responding were proposed to explain how individuals respond in surveys. Researchers investigated the cognitive processes that respondents perform in order to answer questions in surveys. Some of these models are presented below:

Cannell's two-track model (Cannell, Miller, & Oksenberg, 1981). According to this model, there are two routes to an answer. The first route is based on a careful processing of the question. In order to produce an adequate answer, the respondents must comprehend the question. Then they assess the information, retrieve relevant information from memory, integrate and formulate a response. Following that, they evaluate the accuracy of the response, and provide an answer. Before the stage where respondents give an answer, they could switch to the second route and provide an answer based on superficial cues. The answers that are based on superficial cues are likely to be biased by social desirability (i.e., an attempt to enhance socially desirable and minimise some socially undesirable characteristics) (DeMaio, 1984), or other inadequacies.

The four-steps model (Tourangeau, 1984, 1987; Touranageau & Rasinski, 1988). Based on this model, there are four processes that respondents follow to answer a question: comprehension of the question, retrieval of relevant information from long-term memory, use of that information to make a judgment, selection and reporting of an answer. Firstly, respondents attend to the question and its instructions, and identify the information that is needed in order to answer the question. Then, they recall relevant information from memory, although, some information cannot be retrieved, or is poorly retrieved due to several factors including the time elapsed since the events occurred. Respondents then use the information retrieved to make a judgment. Lastly, respondents must report their answers following at least two processes: selecting responses from a set of response options, and editing, where respondents give answers consistent with prior answers or based on social desirability issues. It is important to note that respondents do not necessarily follow all of these processes to answer a question. The exact processes that are used depend on how accurate or quick respondents desire to be.

The satisficing model (Krosnick & Alwin, 1987). This model adopts Tourangeau's four-steps model (1984) and focuses on how respondents carry out the cognitive steps or strategies to answer a question. Each of these four steps involves remarkable cognitive work. To do this work, respondents may be encouraged by several motives, including intellectual challenge, or desire to help the researcher. Respondents who perform all necessary cognitive tasks appear to optimise (Krosnick & Presser, 2010). However, some respondents may agree to participate in a survey without making the necessary effort to provide optimal answers. They appear to choose satisfactory or acceptable answers. They do not try to understand the question fully or recall everything relevant in order to provide an answer. Respondents who have this response behaviour appear to satisfice (Krosnick & Presser, 2010).

The cognitive processes that respondents engage to answer a question could be distorted by several factors (Fowler, 2009; Groves et al., 2004). One potential source of error is an inability to remember relevant information. Other potential sources of error are misunderstanding of a question, failure to follow instructions, difficulties in formatting a response, and so on (Groves et al., 2004). Besides these sources of errors that affect the accuracy of the answers, respondents may simply want to hide the truth in surveys on sensitive topics, such as those that are considered as personal, intrusive or embarrassing, by using motivated misreporting; a deliberate reporting of inaccurate answers (Groves et al., 2004; Lavrakas, 2008; Tourangeau & Yan, 2007).

Theoretical Framework of Misreporting

Respondents may be motivated to misreport their answers in surveys to present a favourable image to an interviewer or researcher, or to retain such an image in their own eyes. The theoretical approaches of symbolic interactionism, impression management, subjective expected utility and self-deception will be discussed.

Symbolic interactionism. Blumer (1969) conceptualised symbolic interactionism as that individuals act toward things or other individuals on the basis of the meanings these things or individuals have for them. The meaning of things is obtained, or results from the social interactions an individual has with others, and the meanings are handled in, and altered through, an interpretative process an individual uses in dealing with the things he or she experiences. Based on the theory of symbolic interactionism, an interview situation can be considered as a distinct form of interaction, with common features with social interaction (Phillips, 1971; Schaeffer & Presser, 2003). In this way, respondents attempt to analyse and interpret an interviewer's expectations prior to giving their answers, in order to get approval and personal satisfaction within this situation (Gosen, 2014; Philips, 1971).

Impression management theory. Impression management (or self-presentation) is theoretically based on symbolic interactionism theory and assumes that individuals interact with other human beings and try to control the impression they give to others (Schlenker, 1980). According to Tedeschi and Riess (1981), "impression management consists of any behavior by a person that has the purpose of controlling or manipulating the attributions and impressions formed of that person by others" (p. 3). Impression management theory assumes that the most important thing is not how an individual views his or her behaviour, but how other people view it (Tedeschi & Riess, 1981). Individuals appear to engage in impression management techniques due to several reasons, including avoiding blame and gaining credit. They tend to use various strategies in order to avoid negative impressions and social disapproval and enhance positive impressions and social approval (Tedeschi & Riess, 1981).

Subjective expected utility theory. This theory is used to explain how individuals weigh their gains and losses when they make decisions in several settings. It assumes that risky decisions depend on two factors. The first factor is called perceived risks, which involves the perceived probabilities of alternative outcomes given each decision option.

The second factor is called perceived losses, and involves the perceived losses (or gains) that are associated with each possible outcome (Von Neumann & Morgenstern, 1947). Nathan, Sirken, Wills, and Esposito (1990) applied the subjective expected utility theory to survey responding. When respondents decide to answer a sensitive question truthfully they might consider perceived risks and losses, such as the embarrassment during the interview. According to Tangney, Miller, Flicker and Barlow (1996), embarrassment involves intense concern about evaluations of the self by others. To avoid embarrassment in everyday life, individuals may lie. In surveys, respondents can deny something embarrassing completely, or they can try to minimise it (Tourangeau et al., 2000). Respondents might also consider the perceived gains, such as the approval from the interviewer or the promotion of knowledge about some topic (Rasinski, Baldwin, Willis, & Jobe, 1994). To sum up, respondents weigh their gains and losses in order to give a truthful answer or not.

Self-Deception. Apart from individuals' desire to maintain a favourable image of themselves in the eyes of other people, they desire to maintain such an image in their own eyes (Krosnick, 1999). Individuals may be concerned with increasing their positives and decreasing their negatives as a way to achieve a high level of self-esteem (Sedikides & Strube, 1997). Self-deception can be automatic and individuals may execute it without being aware of it at all (Krosnick, 1999).

Survey research is based on the assumption that respondents can and will report information in an accurate way. However, the accuracy of survey data appears to be threatened, apart from flaws in the cognitive processes that respondents engage in to produce an answer, due to a respondent's need to present a favourable self-image to an interviewer or researcher, or because of self-deception (Krosnick, 1999).

Self-Reports of Height and Weight and Misreporting

For various reasons such as those described above, deliberate or nondeliberate reporting of inaccurate answers is common in surveys. The current section will specifically focus on misreporting in self-reports of height and weight measurement, and the possible factors that limit the accuracy of these self-reports.

Height, weight, and consequently Body Mass Index (BMI), which is used to classify individuals into underweight, normal weight, overweight and obese categories, are important indicators of population health. They are convenient indices used to identify and monitor obesity, eating disorders and other health conditions in childhood, adolescence and adulthood (Frellick, 2013; Gutin, 2018). They are continuously used by researchers, health professionals, as well as by governmental agencies for policy decisions (Gosse, 2014; Gutin, 2018). Self-report measures, instead of actual measurements, are commonly used to collect height and weight data since they are convenient, time-saving, have low cost, require no training or equipment to record, and allow for sampling large numbers of participants (Bolton-Smith, Woodward, Trunstall-Perdoe, & Morrison, 2000; Gorber, Tremblay, Moher, & Gorber, 2007). While the advantages of self-report measures are undeniable, a question arises about whether self-reported instead of actual measurements in assessing height and weight can be trusted.

Several studies document that self-reports and actual measurements of height and weight are highly correlated, with the values of the correlation coefficients above .90 (e.g., Pursey, Burrows, Stanwell, & Collins, 2014; Roth, Allshouse, Lesh, Polotsky, & Santoro, 2013). However, using high correlations as a sufficient justification for relying on self-reports is raising a problem. Correlations measure the strength of the relationship between self-reports and direct measures. However, they cannot assess the level of agreement between self-reported and measured data, or identify any error in the data (Bland & Altman, 1986, 2003). Porter (2011) labeled this phenomenon as the "correlation fallacy", where high correlations can mask any difference between measures.

The difference between self-reports and actual measurements of height and weight is defined as a reporting error. A difference score significantly greater than zero would indicate an overreporting error, and a difference score significantly less than zero would indicate an underreporting error (Crockett, Schulenberg, & Petersen, 1987). Empirical findings indicate that individuals in general tend to overestimate their height and underestimate their weight, with the degree of discrepancy varying across different demographic, psychological, behavioural or other characteristics (Gorber et al., 2007).

Previous empirical research supports that there is an influence of demographic factors on the differences between self-reported and measured height and weight. Gender has been extensively examined and it has been found that females tend to underestimate their weight more than males (Gil & Mora, 2011), while for height there is a general trend for overestimation in both genders. A disagreement exists regarding whether males exhibit greater overestimation than females or vice versa (Gorber et al., 2007). The reporting of height and weight is related to age, with most studies suggesting a higher overestimation of height in older adults, and greater underestimation of weight in younger adults (Cawley, Maclean, & Kessler, 2017). The weight status of individuals also appears to play a role in misreporting of weight. There is evidence that the higher the BMI, the more likely it is for individuals to underreport their weight (Ambwani & Chmielewski, 2013). The role of other factors on misreporting of height and weight has been also investigated. It has been found that females who were dissatisfied with their bodies tended to underestimate their weight to appear thinner (Rasmussen, Eriksson, & Nordquist, 2007). The accuracy of weight reporting also appears to be related to eating disorder symptomatology. Disordered eating behaviours were related to overestimation of weight in non-clinical females (Conley & Boardman, 2007), although, those diagnosed with eating disorders were found to be relatively accurate reporters of their height and weight by Barnes, White, Masheb, and Grilo (2010). In regards to weight reporting accuracy among people with diabetes, there are mixed findings. Some research suggests weight underestimation in both males and females with diabetes (Yiannakoulia, Panagiotakos, Pitsavos, & Stefanidis, 2006), while other support weight underestimation in males only (Jeffery, 1996), or weight overestimation in males only (Wada et al., 2005). Empirical evidence also supports that social desirability may play a role in weight reporting accuracy. Females with higher scores on social desirability scales tended to underestimate their weight. Males' weight reporting was not related to social desirability scores (Ambwani & Chmielewski, 2013). The frequency or recency of weight measurements was also found to be related to decreased reporting error (e.g., Imrhan, Imrhan, & Hart, 1996). Lastly, previous studies found that individuals who were aware that actual measurements will be followed after the self-reports were more accurate reporters of their height and weight compared to those who were not informed (e.g., Imrhan et al., 1996). The factors that are related to misreporting of height and weight and the possible explanations are discussed in the following chapters in detail.

The literature has indicated some factors that are associated with inaccurate self-reporting of height and weight. However, some of these findings are inconclusive. Potential sources that influence self-reporting have been examined in isolation. Factors that may not be entirely due to participants' inaccurate reporting, such as measurement inconsistencies and problems in the research procedure could also affect self-reports of height and weight. Therefore, it is necessary to investigate the differences between self-reports and actual measurements of height and weight and the specific factors that influence misreporting in self-response in different large-scale representative samples as well as clinical samples, by considering measurement issues that may affect the self-reports of height and weight and following manipulation of key variables.

Overview and Purpose of the Dissertation

As already stated, misreporting is common in self-reports. Self-reports of height and weight often contain considerable reporting error, resulting in overestimation or underestimation of these values. This inaccuracy of height and weight self-reports could undoubtedly lead to misleading estimates of the prevalence of health conditions, including obesity and eating disorders, erroneous assessment and management of these conditions, and ineffective public health policies.

The dissertation is organised into five inter-connected but distinct studies, all of which investigate the differences between self-reports and actual measurements of height and weight in different populations. The purpose of the dissertation is to empirically examine the extent of the differences between self-reported and actual measurements of height and weight and whether these differences are associated with specific demographic and psychological variables in general (Study 1 & Study 2) and clinical (Study 3 & Study 4) populations. The dissertation also aims to examine the extent of the differences between self-reports and actual measurements of height and weight by manipulating the awareness of making actual measurements after the self-reporting stage and controlling for other specific variables that potentially influence the accuracy of height and weight in a sample of university students (Study 5). The dissertation is a combination of secondary analyses of existing data and an experimental procedure with original data to investigate the differences between self-reported and measured height and weight in general and clinical populations.

The importance of the present dissertation lies in the examination of the accuracy of self-reports of height and weight in different samples and contexts to provide a better understanding of the reporting error in the measurement of height and weight and its generalisation in multiple contexts. This work extends the literature on the accuracy of self-reports of height and weight by empirically examining the reporting error in height and weight in representative samples of the general population and in clinical samples, in different ages and body weight statuses, its relation to specific demographic, psychological, personality and behavioural factors, and under experimental manipulations of the awareness of impending actual measurements. The present findings will a) contribute to the existing literature on the accuracy of self-reports of height and weight, b) inform researchers and health professionals who rely on self-reported height and weight for the accuracy of their data, and c) suggest approaches to minimise reporting error in height and weight self-reports.

A brief description of each study is given below:

Study 1 - Examination of the accuracy of self-reports of height and weight in a large, representative sample of older adults in the US. The first study (Chapter 2) aimed to investigate whether there are differences between self-reports and measurements of height and weight, and whether these differences are related to demographic factors among a representative sample of Americans over the age of 50 and their partners of any age from the Health and Retirement Study (HRS). Participants answered questions about their height and weight before the actual measurements and without any knowledge that measurements would be taken. Then anthropometric measurements of height and weight were taken in participants' homes, following specific measurement guidelines. It was examined whether there were differences between self-reported and measured height and weight in the sample. In addition, it was examined whether there were differences due to gender and age. The study also examined the reporting error in height and weight separately for the BMI and racial categories.

Study 2 - Examination of the accuracy of self-reports of weight in a Dutch representative sample. The second study (Chapter 3) aimed to examine whether there are differences between self-reports and actual measurements of weight, the extent of these differences and whether they are related to demographic factors, as well as whether individuals become more accurate reporters of their weight after frequent measurements of weight. A representative sample of Dutch individuals that participated in the Longitudinal Internet Studies for the Social Science (LISS) Weighing Project was used. Participants self-reported their weight before the actual measurements. Then, they were asked to measure their weight in their homes with advanced scales that wirelessly sent the information to the LISS database. Differences between self-reports and measurements of weight due to gender, BMI, and age were examined. Whether respondents become more accurate reporters of their weight after frequent measurements of weight, and whether these tendencies are different for males and females, as well as for younger and older respondents was also examined.

Study 3 - Examination of the accuracy of self-reports of height and weight in adults with type 1 diabetes and disordered eating symptomatology. The aim of the third study (Chapter 4) was to examine whether there are differences between self-reports and measurements of height and weight, the extent of these differences and whether they are related to eating disorder pathology, gender and perfectionism in adults with type 1 diabetes with and without eating disorder pathology. To our knowledge, this is the first study that examined height and weight reporting in individuals with type 1 diabetes with disordered eating pathology. Participants were asked to self-report their height and weight before actual measurements. Actual measurements were taken in the laboratory. They were also asked to complete self-report measures, including the Eating Disorder Examination (EDE), the Eating Inventory (EI), and the Positive and Negative Perfectionism Scale (PANPS).

Study 4 - Examination of the accuracy of self-reports of height and weight among females who have been weight-restored from anorexia nervosa. The fourth study (Chapter 5) aimed to investigate whether there are differences between self-reports and measurements of height and weight, the extent of these differences and whether they are related to eating disorder pathology and perfectionism among females who have been weight-restored from anorexia nervosa compared to healthy controls. Participants were asked to self-report their height and weight. Then, actual measurements were taken in the laboratory. They were also asked to complete questionnaires assessing eating disorder pathology and perfectionism, including the Eating Disorder Examination Questionnaire (EDE-Q) and the Positive and Negative Perfectionism Scale (PANPS).

Study 5 - Examination of the accuracy of self-reports of height and weight by manipulating the awareness of impending actual measurements in university students. The final study (Chapter 6) aimed to examine whether there are differences between self-reports and measurements of height and weight by manipulating the awareness of impending actual measurements of height and weight after the self-reporting stage in a sample of university students. Other factors that potentially influence the accuracy of self-reports of height and weight, such as demographics, body dissatisfaction, eating disorder risk, social desirability, fear of negative evaluation, frequency and recency of height and weight measurements were recorded and accounted for. Participants were administered a questionnaire packet, including demographic information, and self-reported measures to screen for body dissatisfaction, eating disorder risk, social desirability, and fear of negative evaluation. Participants were randomly assigned to informed or uninformed groups. Those in the informed group were asked to self-report their height and weight after being informed that they will be measured afterwards. Those in the uninformed group were asked to self-report their height and weight without having any knowledge about the upcoming actual measurements. The study addressed a limitation of previous studies by collecting actual measurements and self-reported data with no time lapse, in an effort to minimise any potential error associated with environmental and time factors, and by considering other measurement issues, such as equipment, measurement procedures and techniques.

Chapter 2

Study 1: The differences between self-reports and measurements of height and weight among a representative sample of older adults from the Health and Retirement Study

Introduction

Whilst many studies have examined the differences between self-reports and measurements of height and weight in adolescents and young adults (Cash, Counts, Hangen, & Huffine, 1989; Perez et al., 2015), few studies have assessed this issue in older populations. Following the definition by the United Nations (2013), older people are those aged 60 years or older. Ageing is often accompanied by health problems and complications. Any inaccuracy in self-reports of height and weight may have an impact on the assessment and management of these health issues.

Previous studies that investigated the differences between self-reports and actual measurements in older adults concluded that self-reports of height and weight are not very accurate. Self-reported height was generally overestimated and self-reported weight was underestimated (Gunnell et al., 2000; Kuczmarski, Kuczmarski, & Najjar, 2001). It was also found that older males overestimated their height more than older females (Gunnell et al., 2000; Kuczmarski et al., 2001). In regards to weight reporting, some findings support that older females underestimated their weight more than older males (Cawley et al., 2017), and others that older males underestimated their weight more than older females (Pasalich, Lee, Burke, Jancey, & Howat, 2013; Yong & Saito, 2012).

When younger and older adults were compared, there is evidence that the overestimation of height was greater among the older than the younger ones and that the overestimation of height is significantly higher among those individuals who have the greatest loss of height (Cawley et al., 2017; Kuczmarski et al., 2001; Rowland, 1990). On the other hand, younger adults demonstrated greater underestimation of weight compared to the older adults, possibly due to social desirability bias and their desire to avoid social stigma and embarrassment (Cawley et al., 2017).

Different reasons that explain why older adults misreport their height or weight have been suggested. Thinness and tallness are often seen as ideal and this perception may lead to misreporting of height and weight (Sahyoun, Maynard, Zhang, & Serdula, 2008). Even though the importance of appearance seems to be less pronounced among older adults, there may be other reasons associated with misreporting of these characteristics at these age groups (Lahmann & Kumanyika, 1999).

It has been proposed that memory problems and cognitive impairment may have an impact on self-reports of height and weight and make them less reliable in older adults (Dahl, Hassing, Fransson, & Pedersen, 2010). Others have suggested that older people may not be aware about the changes in height and body weight as they get older, and they may recall their height and weight as measured at a younger age (Gunnell et al., 2000; Kuczmarski et al., 2001). For instance, there is a decline in height of older people, which appears to vary from 1 to 2 cm per decade, as a consequence of vertebral compression (Eveleth et al., 1998). In addition, there are changes in body composition of older adults, such as a decrease in fat-free mass and body water and an increase in body fat (Eveleth et al., 1998). Changes in their diet and physical activity may also lead to body changes and to misreporting of height and weight in older adults (Cawley et al., 2017).

However, older females who visited their doctors more frequently or were diagnosed with osteoporosis were more accurate reporters of their height and weight (Craig & Adams, 2009; Yong & Saito, 2012). Therefore, self-monitoring of physiological changes and greater awareness about alterations associated with ageing may facilitate accurate reporting of height and weight values (Craig & Adams, 2009).

As the number of older adults is increasing globally (United Nations, 2017), research on this population and understanding how they behave in terms of misreporting height and weight is vital. Importantly, the inaccuracy of height and weight values could lead to misleading assessment and management of health conditions and have detrimental effects on the health of older adults.

Purpose of the study. This study aims to investigate the accuracy of self-reported height and weight among older adults, and whether the differences between self-reports and actual measurements of height and weight are related to demographic factors such as gender and age. For this purpose, the present study uses a nationally representative sample of US older adults and their partners of any age from the Health and Retirement Study (HRS). The research questions and hypotheses of the study are as follows:

1. Are there any differences between self-reports and measurements of height and weight in this sample?
    - It is hypothesised that on average participants will overestimate their height and underestimate their weight.
2. What is the extent of these differences in males and females, and in younger and older adults?

- It is hypothesised that males will overestimate their height more than females, and females will underestimate their weight more than males.
- It is hypothesised that the overestimation of height will be higher and the underestimation of weight will be less pronounced as individuals get older.

Method

Health and Retirement Study (HRS). The Health and Retirement Study is conducted by the University of Michigan and funded by the National Institute on Aging (grant number NIA U01AG009740). It is a nationally representative longitudinal study of Americans over the age of 50 and their partners that is conducted to find out how they get ready for retirement and how they do after retirement. The HRS collects data from households, and therefore apart from the age - eligible individuals that are randomly selected, their spouses or partners are also included in the sample, regardless of their age. In order to determine eligibility, interviewers conduct a household screening interview. A primary respondent is randomly selected from all age - eligible members of the household, together with his/her partner if he/she is coupled.

In 1992, the HRS initially sampled individuals born in 1931 - 1941 (i.e., then aged 51 - 61) and their partners of any age. Participants were re-interviewed in 1994 and 1996 and combined with the 1993 cohort from the Study of Asset and Health Dynamics of the Oldest Old (AHEAD) (i.e., then aged 70 or older and their partners of any age). In 1998, it sampled those born in 1924 - 1930 and in 1942 - 1947 (i.e., then aged 51 or older). In 2004, those born in 1948 - 1953 were added. Most baseline interviews were conducted face-to-face and took about three hours to complete and most follow-up interviews by telephone, except for those participants over the age of 80 who were offered face-to-face follow-up interviews (Sonnega et al., 2014).

Since 2006, the HRS has utilised a design in which a random half of the core sample is administered the enhanced face-to-face interview, which apart from the main HRS interview also includes physical (e.g., height, weight) and biological measures, and a psychosocial questionnaire. The other random half completes only the core interview by telephone. Data from the enhanced face-to-face interview are available every wave (i.e., every 2 years) on a random half sample, and longitudinally every four years at the individual level (Sonnega et al., 2014).

Secondary analysis. In order to gain access to the data, a registration at the HRS Data Distribution website was followed, and a personal username and password was given for downloading the datafiles.

Data from the 2006 HRS Core (i.e., when the HRS initiated the enhanced face-to-face interview) were downloaded from the HRS website (hrsonline.isr.umich.edu/). It was decided to analyse the 2006 data, since participants were not aware that they would be measured after the self-reports. The data collection period for the 2006 interview was March 2006 - February 2007. The interview is separated into different sections according to the content. For the purpose of the present secondary analysis, selected variables from sections I (Physical Measures), C (Physical Health), A (Coverscreen), B (Demographics), and PR (Respondent) were used. Variables of interest were merged in a single data file. Data downloaded from the HRS contained no identification information of the participants.

Participants were asked questions about their height (“About how tall are you?”) and weight (“How much do you weigh?”), before the actual measurements. Participants were not aware that actual measurements would be taken when they self-reported their height and weight (Cawley et al., 2017; Guyer, Ofstedal, Lessof, & Cox, 2017). Therefore, concerns about dieting or weighing of participants prior to the self-reports are minimised. The time differential between self-reports and measurements was a few hours (Cawley et al., 2017).

In regards to physical measures, anthropometric measurements of height and weight were taken by trained staff in the participants’ homes. Participants were required to read and sign a consent form prior to the measures. Interviewers instructed the participants about the measurements and respondents were asked whether they understood the directions and felt safe to complete them. If the respondents or the interviewers did not feel safe to complete the measurements, they were not administered. Participants were asked not to eat, drink, smoke, chew gum or brush teeth during the measurements. They were also asked to remove shoes, heavy clothing and any pocket items during the measurements.

Height was measured by instructing the participants to stand against a wall without shoes. Then a mark was made on a post-it on the wall behind the top of the participant’s head, and then the interviewer measured the distance from the floor to the mark. Height was recorded in inches to the nearest quarter inch. Participants who were not able to stand were not eligible to participate. Weight was measured by instructing the participants to step on a Healthometer 830 kiloliter scale. The scale was placed on a non-carpeted area. Weight was recorded to the nearest half pound. Participants whose self-reported weight (collected earlier in the interview) was 300 pounds or greater, or were unable to stand were not eligible to participate (Crimmins et al., 2008).

The datafile with the merged variables of interest contained information from 18469 respondents. The enhanced face-to-face interview was administered to 9570 respondents in 2006. The remaining 8899 respondents were assigned to the enhanced face-to-face interview in 2008. From the 9570 respondents, we excluded 25 cases with proxy responses, where spouse or other family member completed the self-reports of height and weight. We also excluded those respondents who wore shoes during height (N = 969) and weight (N = 778) measurements, were measured on high-pile carpet during height (N = 101) and weight (N = 41) measurements, and were not compliant with height (N = 7) and weight (N = 4) measurements due to illness, pain or other symptoms or discomforts. Lastly, those with missing self-reported or measured height (N = 2207) and weight (N = 2417) were also excluded.

Sample. A total of 6261 HRS respondents (N_{males} = 2470, $N_{females}$ = 3791) aged 30 to 99 years (M = 66.59, SD = 10.47) had self-reported and measured height (in inches) and 6305 respondents (N_{males} = 2502, $N_{females}$ = 3803) aged 30 to 104 years (M = 66.83, SD = 10.49) had self-reported and measured weight (in pounds).

We compared respondents who were selected vs. those who were excluded from the analyses to check whether they differed in terms of age and gender. Their characteristics are presented in Tables 2.1 and 2.2. for height and weight respectively. For height, a total of 3309 respondents (N_{males} = 1497, $N_{females}$ = 1812) aged 32 to 104 years (M = 70.16, SD = 12.08) were excluded. Respondents that were selected differed significantly from those that were excluded in terms of age, $t(5960.33) = 14.38$, $p < .001$, $d = 0.32$, and gender, χ^2 (1) = 29.90, $p < .001$. For weight, a total of 3265 respondents (N_{males} = 1465, $N_{females}$ = 1800) aged 32 to 102 years (M = 69.75, SD = 12.18) were excluded. Respondents that were selected differed significantly from those that were excluded in terms of age, $t(5811.90) = 11.63$, $p < .001$, $d = 0.26$, and gender, χ^2 (1) = 23.85, $p < .001$. Respondents who were excluded from the analyses were on average older and there were more males compared to those who were selected.

Table 2. 1. *Characteristics for selected vs. excluded respondents from the analysis for height*

Variable	Excluded (N = 3309) *M (SD)* or %	Selected (N = 6261) *M (SD)* or %
Age	70.16 (12.08)	66.59 (10.47)
Gender	54.8% females	60.5% females

Table 2. 2. *Characteristics for selected vs. excluded respondents from the analysis for weight*

Variable	Excluded (*N* = 3265)	Selected (*N* = 6305)
	M (SD) or %	*M (SD)* or %
Age	69.75 (12.18)	66.83 (10.49)
Gender	55.1% females	60.3% females

Statistical analysis. We calculated reporting error in height and weight using the following formulas:

$$\text{Reporting error in weight}_i = \text{Self-reported weight}_i - \text{Measured weight}_i \quad (2.1)$$

$$\text{Reporting error in height}_i = \text{Self-reported height}_i - \text{Measured height}_i \quad (2.2)$$

for each individual *i*. Cohen's *d* was used to evaluate the differences, with the values of 0.2, 0.5 and 0.8 indicating small, medium and large effect sizes respectively (Cohen, 1992). Independent samples *t*-tests were performed for gender differences. Hierarchical multiple regressions were performed to examine quadratic relations. Pearson's *r* correlations or Spearman's *rho* were performed for reporting error with age. One-way between groups ANOVAs were performed to indicate whether there are significant differences in the mean scores on the reporting error in height and weight across the seven age groups. Planned contrasts were performed where each age group was compared to each younger age group. Finally, reporting error in height and weight was modeled on age and gender after controlling for BMI and race categories.

Results

HRS respondents over age 50 and their partners of any age

Descriptive statistics. Table 2.3 presents the descriptive statistics for the HRS variables that were used in the analysis. The mean measured height was 65.26 inches, which was about 1 inch lower than the mean self-reported height of 66.09 inches. The mean measured weight was 176.37 pounds, which was approximately 3 pounds higher than the mean self-reported weight of 173.27 pounds. The mean reporting error in height was 0.83 inches and the mean reporting error in weight was -3.10 pounds.

There were some outliers for the reporting error in height and weight. In total, 88 cases with reporting error in height | *z*-scores | > 3, and 107 cases with reporting error in weight | *z*-scores | > 3 were flagged as outliers. The descriptive statistics for the main variables including and excluding the outliers are shown in Table 2.3.

One-sample t-tests. One-sample *t*-tests (two-tailed) indicated that participants on average overestimated their height and underestimated their weight.

The reporting error in height was significantly different from zero for the overall sample, $t(6260) = 45.65$, $p < .001$, $d = 0.58$; for the overall sample (excluding outliers), $t(6172) = 60.05$, $p < .001$, $d = 0.76$; for males, $t(2469) = 33.75$, $p < .001$, $d = 0.68$; for males (excluding outliers), $t(2431) = 46.74$, $p < .001$, $d = 0.95$; for females, $t(3790) = 31.57$, $p < .001$, $d = 0.51$; and for females (excluding outliers), $t(3740) = 40.20$, $p < .001$, $d = 0.66$[1]. The *d* values indicated medium to large effect sizes.

The reporting error in weight was significantly different from zero for the overall sample, $t(6304) = -23.06$, $p < .001$, $d = -0.29$; for the overall sample (excluding outliers), $t(6197) = -34.28$, $p < .001$, $d = -0.44$; for males, $t(2501) = -11.72$, $p < .001$, $d = -0.23$; for males (excluding outliers), $t(2455) = -16.92$, $p < .001$, $d = -0.34$; for females, $t(3802) = -20.63$, $p < .001$, $d = -0.33$; and for females (excluding outliers), $t(3741) = -30.76$, $p < .001$, $d = -0.50$[2]. The *d* values indicated small to medium effect sizes.

[1] One-tailed one-sample *t*-tests were also performed to test if the reporting error in height is significantly different from zero, and the results were similar.

[2] One-tailed one-sample *t*-tests were also performed to test if the reporting error in weight is significantly different from zero, and the results were similar.

Table 2. 3. *Descriptive statistics for the main variables for HRS respondents over age 50 and their partners of any age*

Variable	*N*	Range	Mean (*SD*)	Skewness (*SE*)	Kurtosis (*SE*)
Reporting error in height (inches)					
Overall	6261	-13.5 - 13.5	0.83 (1.45)	-0.36 (0.03)	17.54 (0.06)
Overall (excl. outliers)	6173	-3.5 - 5	0.84 (1.10)	0.38 (0.03)	1.07 (0.06)
Males	2470	-13.5 - 13.5	0.99 (1.45)	-1.57 (0.05)	18.33 (0.10)
Males (excl. outliers)	2432	-3.5 - 5	1.04 (1.09)	0.06 (0.05)	0.94 (0.10)
Females	3791	-12.5 - 13	0.73 (1.43)	0.45 (0.04)	18.33 (0.08)
Females (excl. outliers)	3741	-3.5 - 5	0.71 (1.09)	0.06 (0.04)	1.50 (0.08)
Reporting error in weight (pounds)					
Overall	6305	-135 - 199	-3.10 (10.68)	-0.46 (0.03)	49.23 (0.06)
Overall (excl. outliers)	6198	-34.5 - 28	-2.93 (6.72)	-0.51 (0.03)	2.72 (0.06)
Males	2502	-132 - 199	-2.71 (11.57)	-0.11 (0.05)	61.73 (0.10)
Males (excl. outliers)	2456	-33.5 - 27.5	-2.37 (6.95)	-0.21 (0.05)	1.68 (0.10)
Females	3803	-135 - 91.5	-3.36 (10.04)	-0.83 (0.04)	32.77 (0.08)
Females (excl. outliers)	3742	-34.5 - 28	-3.29 (6.54)	-0.77 (0.04)	3.49 (0.08)

Reporting error and gender differences. While both males and females overestimated their height, the reporting error in height was on average larger for males (*M* = 0.99, *SD* = 1.45) than for females (*M* = 0.73, *SD* = 1.43), $t(6259) = 6.78$, $p < .001$, $d = 0.18$, indicating a small effect size[3]. After excluding the outliers, the reporting error in height was on average larger for males (*M* = 1.04, *SD* = 1.10) than for females (*M* = 0.71, *SD* = 1.09), $t(6171) = 11.35$, $p < .001$, $d = 0.30$, indicating a small effect size[4].

Both males and females underestimated their weight, but the reporting error in weight was on average larger (smaller in number, but a larger deviation from zero) for females (*M* = -3.36, *SD* = 10.04) than for males (*M* = -2.71, *SD* = 11.57), *t*(4817.46) =

[3] A Mann-Whitney Test also indicated that this difference was significant, $U = 3824948.50$, $Z = -12.30$, $p < .001$.

[4] A Mann-Whitney Test also indicated that this difference was significant, $U = 3654770$, $Z = -13.12$, $p < .001$.

2.30, p = .02, d = 0.06, indicating a very small effect size[5]. Similarly, after excluding the outliers, the reporting error in weight was on average larger (in absolute value) for females (M = -3.29, SD = 6.54) than for males (M = -2.37, SD = 6.95), t(5028.32) = 5.22, p < .001, d = 0.14, indicating a small effect size[6].

HRS respondents 60 years or older

Following the definition by the United Nations (2013) that older people are those aged 60 years or older, a separate analysis of data excluding respondents under 60 years was also performed. The samples were further reduced by 1782 respondents with self-reported and measured height and 1743 respondents with self-reported and measured weight.

Descriptive statistics. Table 2.4 presents descriptive statistics for the main variables. The mean measured height was 65.05 inches, which was about 1 inch lower than the mean self-reported height of 66 inches. The mean measured weight was 173.67 pounds, which was approximately 3 pounds higher than the mean self-reported weight of 170.81 pounds. The mean reporting error in height was 0.95 inches and the mean reporting error in weight was -2.85 pounds.

The analyses were repeated excluding the outliers. From the height sample of 6173 respondents without outliers, we excluded 1750 respondents under 60 years. From the weight sample of 6198 respondents without outliers, we excluded 1695 respondents under 60 years. The mean reporting error in height excluding the outliers was 0.96 inches and the mean reporting error in weight excluding the outliers was -2.62 pounds. Their characteristics are also presented in Table 2.4.

One-sample t-tests. One-sample t-tests (two-tailed) indicated that participants 60 years or older on average overestimated their height and underestimated their weight.

The reporting error in height was significantly different from zero for the overall sample, t(4478) = 44.70, p < .001, d = 0.67; for the overall sample (excluding outliers), t(4422) = 57.50, p < .001, d = 0.86; for males, t(1823) = 30.56, p < .001, d = 0.72; for males (excluding outliers), t(1794) = 43.62, p < .001, d = 1.03; for females, t(2654) = 32.80, p < .001, d = 0.64; and for females (excluding outliers), t(2627) = 39.15, p < .001, d = 0.76[7]. The d values indicated medium to large effect sizes.

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[5] A Mann-Whitney Test also indicated that this difference was significant, U = 4443959, Z = -4.44, p < .001.

[6] A Mann-Whitney Test also indicated that this difference was significant, U = 4261330.50, Z = -4.85, p < .001.

[7] One-tailed one-sample t-tests were also performed to test if the reporting error in height is significantly different from zero, and the results were similar.

The reporting error in weight was significantly different from zero for the overall sample, $t(4561) = -19.59$, $p < .001$, $d = -0.29$; for the overall sample (excluding outliers), $t(4502) = -27.16$ $p < .001$, $d = -0.40$; for males, $t(1846) = -9.51$, $p < .001$, $d = -0.22$; for males (excluding outliers), $t(1814) = -13.65$, $p < .001$, $d = -0.32$; for females, $t(2714) = -18.61$, $p < .001$, $d = -0.36$; and for females (excluding outliers), $t(2687) = -24.18$, $p < .001$, $d = -0.47$[8]. The *d* values indicated small to medium effect sizes.

Table 2. 4. *Descriptive statistics for the main variables for HRS respondents 60 years or older*

Variable	*N*	Range	Mean (*SD*)	Skewness (*SE*)	Kurtosis (*SE*)
Reporting error in height (inches)					
Overall	4479	-13.5 - 13	0.95 (1.42)	-0.57 (0.04)	16.66 (0.07)
Overall (excl. outliers)	4423	-3.5 - 5	0.96 (1.11)	0.30 (0.04)	1.01 (0.07)
Males	1824	-13.5 - 9.8	1.08 (1.51)	-2.22 (.06)	18.45 (0.12)
Males (excl. outliers)	1795	-3.5 - 5	1.15 (1.12)	-0.01 (0.06)	1.01 (0.12)
Females	2655	-10.8 - 13	0.86 (1.35)	0.99 (0.05)	15.75 (0.10)
Females (excl. outliers)	2628	-3.5 - 5	0.83 (1.09)	0.53 (0.05)	1.34 (0.10)
Reporting error in weight (pounds)					
Overall	4562	-104 - 199	-2.85 (9.84)	0.16 (0.04)	64.77 (0.07)
Overall (excl. outliers)	4503	-34.5 - 27.5	-2.62 (6.47)	-0.45 (0.04)	2.88 (0.07)
Males	1847	-104 - 199	-2.52 (11.39)	0.96 (0.06)	73.78 (0.11)
Males (excl. outliers)	1815	-33.5 - 27.5	-2.13 (6.66)	-0.18 (0.06)	2.13 (0.12)
Females	2715	-97 - 91.5	-3.08 (8.63)	-1.17 (0.05)	31.30 (0.09)
Females (excl. outliers)	2688	-34.5 - 25	-2.95 (6.32)	-0.68 (0.05)	3.43 (0.09)

Reporting error and gender differences. Both males and females overestimated their height but the reporting error in height was on average larger for males ($M = 1.08$, $SD = 1.51$) than for females ($M = 0.86$, $SD = 1.35$), $t(3610.68) = 5.13$, $p < .001$, $d = 0.16$,

[8] One-tailed one-sample *t*-tests were also performed to test if the reporting error in weight is significantly different from zero, and the results were similar.

indicating a small effect size[9]. Similarly, after excluding the outliers, the reporting error in height was on average larger for males (M = 1.15, SD = 1.12) than for females (M = 0.83, SD = 1.09), $t(4421) = 9.43$, $p < .001$, $d = 0.29$, indicating a small effect size[10].

Even though the reporting error in weight was on average larger (in absolute value) for females (M = -3.08, SD = 8.63) than for males (M = -2.52, SD = 11.39), an independent samples t-test indicated that this difference was not significant, $t(3234.15) = 1.79$, $p = .07$, $d = 0.06$, indicating a very small effect size[11]. An independent samples t-test was also performed after excluding the outliers. The reporting error in weight was on average larger (in absolute value) for females (M = -2.95, SD = 6.32) than for males (M = -2.13, SD = 6.66), $t(3753.79) = 4.11$, $p < .001$, $d = 0.13$, indicating a small effect size[12].

HRS respondents over age 50 and their partners of any age

We now analyse the reporting error in height and weight, and age in the sample of HRS participants over age 50 and their partners regardless of their age, to allow for examination of differences between self-reports and measurements in younger and older adults in the sample.

Reporting error and age differences. The relation between age and the reporting error in height was examined using both linear and quadratic functions (see Figure 2.1). We also examined this relationship using a cubic function. Adding the cubic term did not improve the R-squared greatly as compared to the quadratic function, and was not used in the analysis. The reporting error in height was on average near zero at younger ages, and larger at older ages. As shown in Figure 2.1, linear and quadratic relations between age and the reporting error in height can be detected graphically. We proceeded with hierarchical multiple regressions with the reporting error in height as the dependent variable. Age was entered at Model 1 of the regression and represented the linear function. Age_squared variable was calculated, entered at Model 2 and represented the quadratic function.

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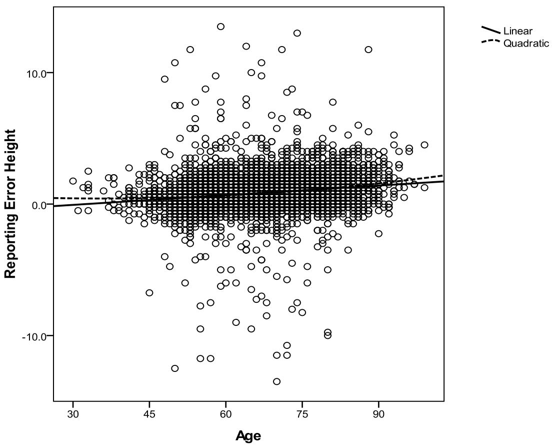
[9] A Mann-Whitney Test also indicated that this difference was significant, $U = 1993584$, $Z = -10.09$, $p < .001$.

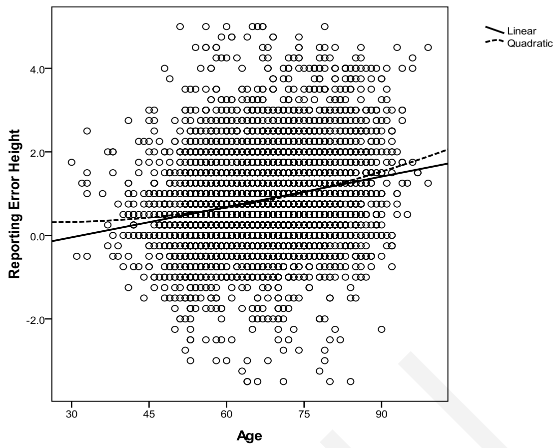
[10] A Mann-Whitney Test also indicated that this difference was significant, $U = 1908136$, $Z = -10.84$ $p < .001$.

[11] A Mann-Whitney Test indicated that this difference was significant, $U = 2361084.50$, $Z = -3.35$, $p = .001$.

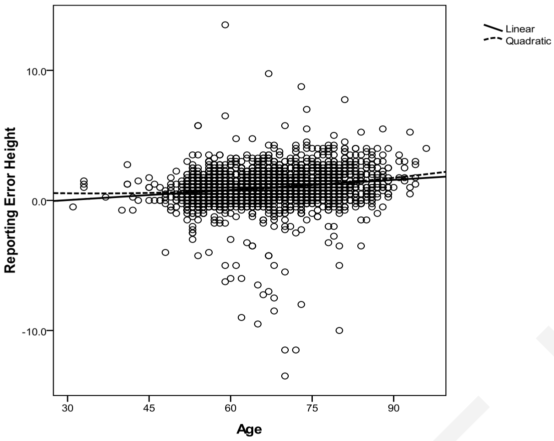
[12] A Mann-Whitney Test also indicated that this difference was significant, $U = 2280626.50$, $Z = -3.71$, $p < .001$.



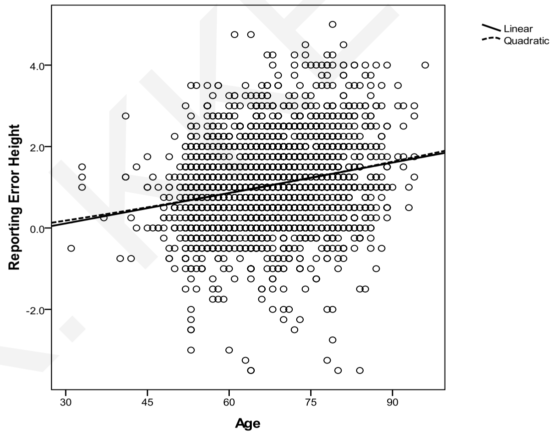
a) Overall sample



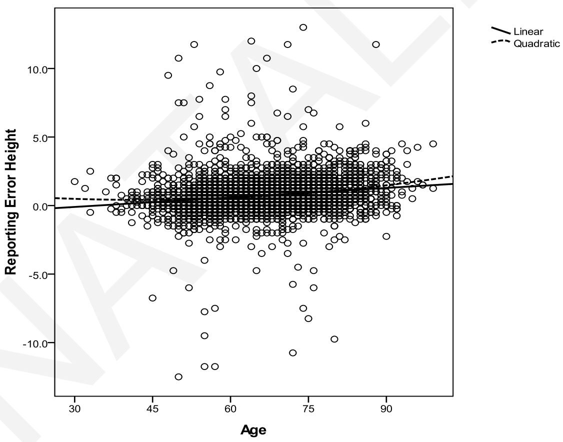
b) Overall sample (excluding outliers)



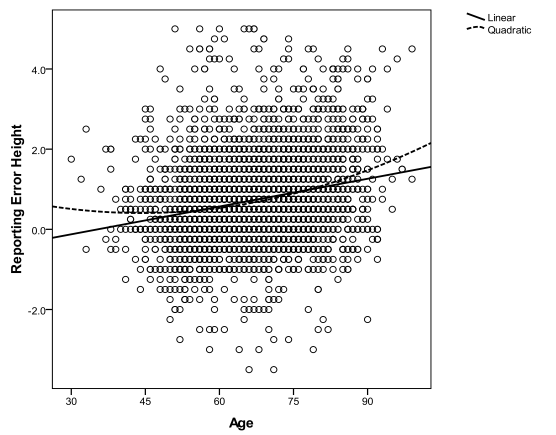
c) Male sample



d) Male sample (excluding outliers)



e) Female sample



f) Female sample (excluding outliers)

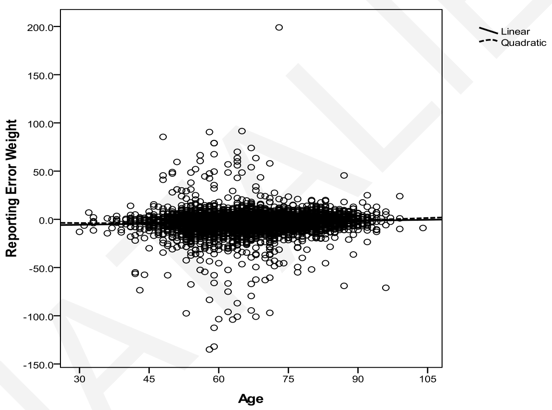
Figure 2. 1. Scatterplots of the reporting error in height and age.

There were both linear and quadratic relations between age and reporting error in height (see Appendix A). Age and reporting error in height were positively correlated, Spearman's *rho* = .23, $p < .001$ for the overall sample; Pearson's $r = .18$, and Spearman's *rho* = .23 $p < .001$ for males; and Spearman's *rho* = .22, $p < .001$ for females.

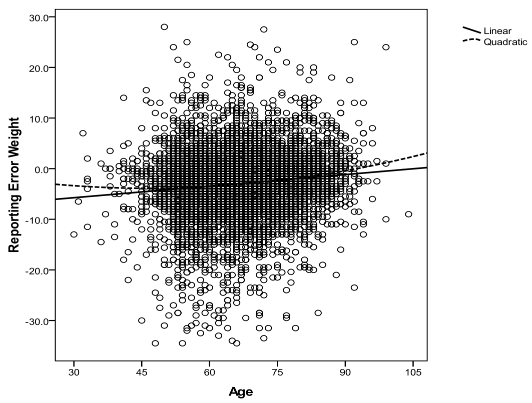
When the outliers were excluded, there were both linear and quadratic relations between age and reporting error in height (see Appendix B). Age and reporting error in height (excluding outliers) were positively correlated, Spearman's *rho* = .23, $p < .001$ for the overall sample; Pearson's $r = .23$, and Spearman's *rho* = .23, $p < .001$ for males; and Spearman's *rho* = .23, $p < .001$ for females.

To sum up, the results indicate that the overestimation of height tends to be larger as individuals get older.

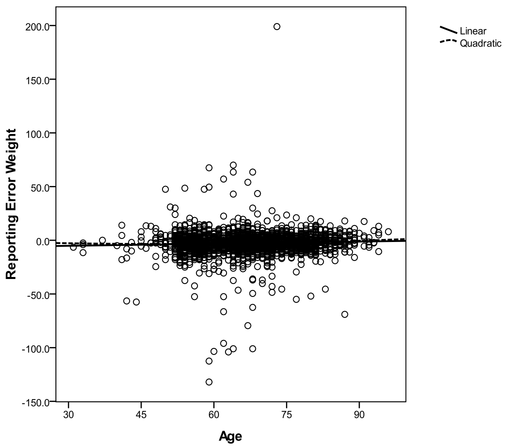
The relation between age and the reporting error in weight was examined using both linear and quadratic functions (see Figure 2.2). We also examined this relationship using a cubic function. Adding the cubic term did not improve the *R*-squared greatly as compared to the quadratic function, and was not used in the analysis. As shown in Figure 2.2, linear and quadratic relations between age and the reporting error in weight can be found. Hierarchical multiple regressions were performed with the reporting error in weight as the dependent variable. Age was entered at Model 1 of the regression and represented the linear function. Age_squared variable was calculated, entered at Model 2 and represented the quadratic function.



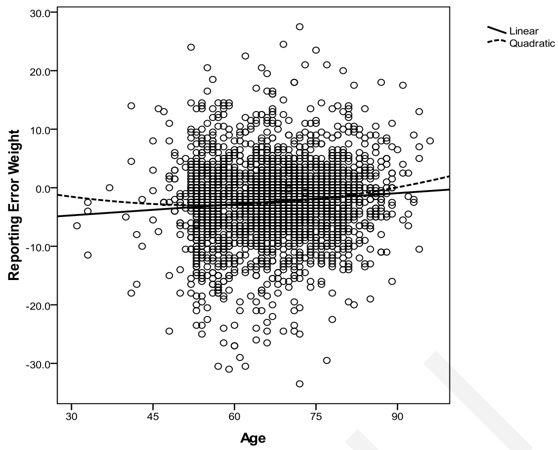
a) Overall sample



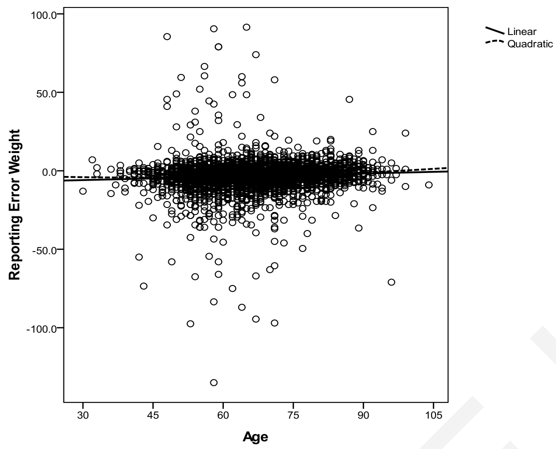
b) Overall sample (excluding outliers)



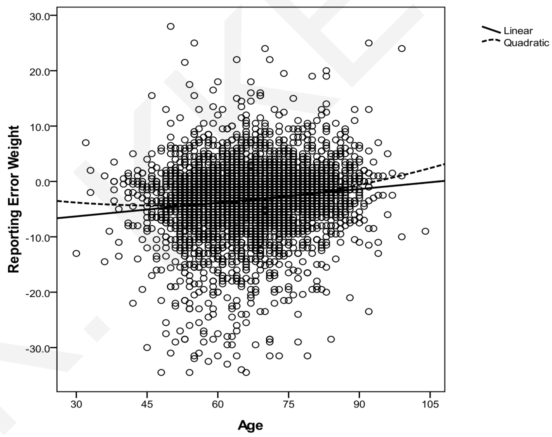
c) Male sample



d) Male sample (excluding outliers)



e) Female sample



f) Female sample (excluding outliers)

Figure 2. 2. Scatterplots of the reporting error in weight and age.

There were no quadratic relations between age and the reporting error in weight (see Appendix C) and the strength of the relation was examined with Pearson's *r* correlations. Age and reporting error in weight were positively correlated, $r = .07$, $p < .001$ for the overall sample; $r = .06$ $p = .005$ for males; and $r = .08$, $p < .001$ for females.

When the outliers were excluded, there were quadratic relations between age and the reporting error in weight (see Appendix D). The strength of the relations was examined with Spearman's *rho.* Age and reporting error in weight (excluding outliers) were positively correlated, Spearman's $rho = .11$, $p < .001$ for the overall sample; Spearman's $rho = .07$, $p < .001$ for males; and Spearman's $rho = .13$, $p < .001$ for females.

To sum up, the results indicate weak, positive associations, implying that the underreporting of weight tends to be less pronounced as individuals get older.

Reporting error and age group differences. Participants were separated into different age groups according to their ages. In total, seven age groups were formed for height: 1) 30 - 39 years old, 2) 40 - 49 years old, 3) 50 - 59 years old, 4) 60 - 69 years old, 5) 70 - 79 years old, 6) 80 - 89 years old, and 7) 90 - 99 years old. The reporting error in height by age group can be seen in Table 2.5.

In addition, seven age groups were formed for weight: 1) 30 - 39 years old, 2) 40 - 49 years old, 3) 50 - 59 years old, 4) 60 - 69 years old, 5) 70 - 79 years old, 6) 80 - 89 years old, and 7) 90 - 104 years old. The reporting error in weight by age group can be seen in Table 2.6. Overall, and with the exception of the youngest group of 20 individuals, the average overreporting of height tends to be larger and the average underreporting of weight lower for the older groups.

Table 2. 5. *Descriptive statistics of the age groups for the reporting error in height*

Age groups	Reporting error in height		Reporting error in height (excl. outliers)	
	N	*M (SD)*	*N*	*M (SD)*
30 - 39 years	20	0.81 (1.01)	20	0.81 (1.01)
40 - 49 years	193	0.47 (1.37)	189	0.51 (0.97)
50 - 59 years	1569	0.55 (1.48)	1541	0.54 (1.01)
60 - 69 years	2048	0.80 (1.31)	2025	0.82 (1.03)
70 - 79 years	1670	0.96 (1.49)	1647	0.98 (1.11)
80 - 89 years	692	1.28 (1.50)	683	1.27 (1.23)
90 - 99 years	69	1.74 (1.48)	68	1.69 (1.43)

Table 2. 6. *Descriptive statistics of the age groups for the reporting error in weight*

Age groups	Reporting error in weight		Reporting error in weight (excl. outliers)	
	N	*M (SD)*	*N*	*M (SD)*
30 - 39 years	20	-4.20 (6.14)	20	-4.20 (6.14)
40 - 49 years	183	-4.37 (14.54)	175	-3.83 (7.60)
50 - 59 years	1540	-3.67 (12.40)	1500	-3.73 (7.27)
60 - 69 years	2054	-3.39 (11)	2018	-3.19 (6.79)
70 - 79 years	1716	-2.88 (9.15)	1699	-2.62 (6.09)
80 - 89 years	714	-1.46 (7.31)	709	-1.24 (6.01)
90 - 104 years	78	-0.99 (10.99)	77	-0.08 (7.55)

One-way ANOVA was performed and indicated that there was a significant effect of age groups on the reporting error in height, Welch's *F*[13](6, 218.14) = 28.27, $p < .001$. Planned contrasts were performed, where each age group was compared to the previous age group. Participants aged 60 - 69 years old overestimated their height more than those aged 50 - 59 years old, *t*(3137.34) = -5.33, $p < .001$, $d = 0.18$. Those aged 70 - 79 years old overestimated their height more than those aged 60 - 69 years old, *t*(3349.86) = -3.36, $p = .001$, $d = 0.11$. Participants aged 80 - 89 years old overestimated their height more than those aged 70 - 79 years old, *t*(1282.26) = -4.79, $p < .001$, $d = 0.21$. Lastly, participants aged 90 - 99 years old overestimated their height more than those aged 80 - 89 years old, *t*(82.45) = -2.46, $p = .002$, $d = 0.31$. The difference in the reporting error in height between participants aged 30 - 39 and 40 - 49 years was not significant, *t*(26.74) = 1.41, $p = .17$, $d = 0.29$. In addition, the difference in the reporting error in height between those aged 40 - 49 and 50 - 59 years was not significant, *t*(251.09) = -0.81, $p = .42$, $d = 0.06$.

One-way ANOVA was also performed for the data excluding the outliers and indicated that there was a significant effect of age groups on the reporting error in height, Welch's *F*(6, 216.02) = 48.13, $p < .001$. Planned contrasts indicated that participants aged 60 - 69 years overestimated their height more than those aged 50 - 59 years, *t*(3343.86) = -8.21, $p < .001$, $d = 0.27$. Those aged 70 - 79 years overestimated their height more than those aged 60 - 69 years, *t*(3407.75) = -4.50, $p < .001$, $d = 0.15$. Participants aged 80 - 89 years overestimated their height more than those aged 70 - 79 years, *t*(1161.23) = -5.43, $p < .001$, $d = 0.25$. Participants aged 90 - 99 years old overestimated their height more than

[13] The assumption of homogeneity of variances has been violated and Welch's *F* was conducted.

those aged 80 - 89 years old, $t(77.21) = -2.33$, $p = .02$, $d = 0.31$. The difference in the reporting error for height between participants aged 30 - 39 and 40 - 49 years was not significant, $t(22.84) = 1.29$, $p = .21$, $d = 0.30$. In addition, the difference in the reporting error in height between those aged 40 - 49 and 50 - 59 years was not significant, $t(241.01) = -0.38$, $p = .70$, $d = 0.03$.

In addition, one-way ANOVA was performed and indicated that there was a significant effect of age groups on the reporting error in weight, Welch's $F(6, 223.25) = 7.04$, $p < .001$. Planned contrasts indicated that only participants aged 80 - 89 significantly underestimated their weight less than those aged 70 - 79 years, $t(1653.92) = -4.05$, $p < .001$, $d = 0.17$. The differences in the reporting error in weight between those aged 30 - 39 and 40 - 49 years, $t(47.53) = 0.10$, $p = .93$, $d = 0.02$; those aged 40 - 49 and 50 - 59 years, $t(214.64) = -0.62$, $p = .54$, $d = 0.05$; those aged 50 - 59 and 60 - 69 years, $t(3085.61) = -0.71$, $p = .48$, $d = 0.02$; those aged 60 - 69 and 70 - 79 years, $t(3767.92) = -1.55$, $p = .12$, $d = 0.05$, and those aged 80 - 89 and 90 - 104 years, $t(84.59) = -0.36$, $p = .72$, $d = .05$ were not significant.

One-way ANOVA was also performed for the data excluding outliers and indicated that there was a significant effect of age groups on the reporting error in weight, Welch's $F(6, 220.25) = 15.50$, $p < .001$. Planned contrasts indicated that participants aged 60 - 69 years underestimated their weight less than those aged 50 - 59 years, $t(3102.47) = -2.22$, $p = .03$, $d = 0.08$. Participants aged 70 - 79 years underestimated their weight less than those aged 60 - 69 years, $t(3700.26) = -2.71$, $p = .007$, $d = 0.09$. Participants aged 80 - 89 years underestimated their weight less than those aged 70 - 79 years, $t(1342.24) = -5.11$, $p < .001$, $d = 0.23$. The differences in the reporting error in weight between those aged 30 - 39 and 40 - 49 years, $t(26.14) = -0.25$, $p = .81$, $d = 0.05$; those aged 40 - 49 and 50 - 59 years, $t(212.88) = -0.17$, $p = .87$, $d = 0.01$, and those aged 80 - 89 and 90 - 104 years, $t(86.75) = -1.30$, $p = .20$, $d = 0.17$ were not significant.

Overall, it seems that with the outliers included, there were not many differences between the age groups on the reporting error in weight. After excluding the outliers, there were some differences between the age groups, but not among all age groups. Even though there is a decreasing trend in the averages of the reporting error in weight as people get older, it seems that the large standard deviations (i.e., the age groups are very variable in the reporting error in weight) result in non-significant differences.

Prediction of the reporting error in height and weight controlling for BMI

Table 2.7 presents correlations between the reporting errors in height and weight and age by the four BMI categories. With the exception of the underweight category, there were significant positive correlations between the reporting error in height and age for the normal weight individuals, *r* = .25 for the overall sample, *r* = .17 for males and *r* = .28 for females, all *p*s < .001; for the overweight individuals, all *rs* = .24, *p* < .001, and for the obese individuals, *r* = .26 for the overall sample, *r* = .27 for males, and *r* = .25 for females, all *p*s < .001.

There were also weak positive significant correlations between the reporting error in weight and age for the normal weight individuals, *r* = .10 for the overall sample and *r* = .17 for females, all *p*s < .001, but a non-significant correlation for males; for the overweight individuals, *r* = .10, *p* < .001 for the overall sample, *r* = .08, *p* = .01 for males, and *r* = .12, *p* < .001 for females; and for the obese individuals, *r* = .08, *p* < .001 for the overall sample, *r* = .08, *p* = .02 for males, and *r* = .08, *p* = .004 for females. Correlations were not significant for the underweight category.

Except for the underweight BMI category, the results indicate weak positive associations between the reporting errors and age for the normal weight, overweight and obese individuals. As individuals get older, the overestimation of height tends to be larger and the underestimation of weight less pronounced.

Table 2. 7. *Correlations of age with the reporting error in height and weight by BMI categories*

Correlation coefficients of age with	Sample	BMI categories			
		Underweight (N = 52)	Normal weight (N = 1336)	Overweight (N = 2129)	Obese (N = 2237)
Reporting error in height	Overall	.003	.25**	.24**	.26**
	Males	-.58	.17**	.24**	.27**
	Females	.13	.28**	.24**	.25**
Reporting error in weight	Overall	.14	.10**	.10**	.08**
	Males	.42	-.04	.08*	.08*
	Females	.12	.17**	.12**	.08*

* $p < .05$, ** $p < .001$

A multiple regression was performed to investigate whether age, gender and BMI categories could significantly predict the reporting error in height. The results of the regression (Table 2.8) indicated that the model explained 8.3% of the variance. Age (*B* = 0.03, *p* < .001) and gender (*B* = -0.31, *p* < .001) contributed significantly to the model.

Controlling for BMI category, older individuals and males overestimated their height more. The reporting error in height (overestimation) was greater for the obese than the normal weight individuals (*B* = 0.23, $p < .001$).

Table 2. 8. *Multiple regression analysis for predicting reporting error in height*

Variable	*B*	*SE B*	β
Constant	-0.45	0.11	
Age	0.03	0.001	0.24^{**}
Gender	-0.31	0.03	-0.14^{**}
Normal weight vs. Underweight	0.15	0.15	0.01
Normal weight vs. Overweight	0.06	0.04	0.03
Normal weight vs. Obese	0.23	0.04	0.10^{**}

Note. Adjusted R^2 = 0.083, ** $p < .001$

A multiple regression was also performed to investigate whether age, gender and BMI categories could significantly predict the reporting error in weight. The results of the regression (Table 2.9) indicated that the model explained 9.6% of the variance. Age (*B* = 0.05, $p < .001$) and gender (*B* = -1.22, $p < .001$) contributed significantly to the model. Controlling for BMI category, older individuals and males underestimated their weight less (reporting error closer to zero). The reporting error in weight (underestimation) was greater for the overweight than the normal weight individuals (*B* = -2.24, $p < .001$), and for the obese than the normal weight individuals (*B* = -4.56, $p < .001$). The overestimation of weight was greater for the underweight than the normal weight individuals (*B* = 3.53, $p < .001$).

Table 2. 9. *Multiple regression analysis for predicting reporting error in weight*

Variable	*B*	*SE B*	β
Constant	-1.99	0.65	
Age	0.05	0.01	0.08^{**}
Gender	-1.22	0.17	-0.09^{**}
Normal weight vs. Underweight	3.53	0.89	0.05^{**}
Normal weight vs. Overweight	-2.24	0.22	-0.16^{**}
Normal weight vs. Obese	-4.56	0.22	-0.34^{**}

Note. Adjusted R^2 = 0.096, ** $p < .001$

Prediction of the reporting error in height and weight controlling for race

Table 2.10 presents correlations between the reporting errors in height and weight and age by race. There were significant correlations between the reporting error in height and age for the White/ Caucasian individuals, all *rs* = .23, $p < .001$; for the Black/ African Americans, $r = .29$, $p < .001$ for the overall sample, $r = .19$, $p = .003$ for males, and $r = .33$, $p < .001$ for females, and for individuals of other races, $r = .26$, $p < .001$ for the overall sample, and $r = .29$, $p < .001$ for females.

There were also significant weak positive correlations between the reporting error in weight and age for the White/ Caucasian individuals, $r = .13$ for the overall sample, $r = .10$ for males, and $r = .15$ for females, all *p*s < .001; for the Black/ African Americans, $r = .11$, $p = .003$ for the overall sample, and for females, $r = .16$, $p = .001$. No significant correlations were found for the Other group.

The results indicate weak positive associations between the reporting errors and age for the White/ Caucasian, Black/ African American individuals (particularly females) and the individuals of other races (for the latter group only for height). As individuals get older, the overestimation of height tends to be larger and the underestimation of weight less pronounced.

Table 2. 10. *Correlations of age with the reporting error in height and weight by race categories*

Correlation coefficients of age with	Sample	Race: White/ Caucasian (N = 4807)	Race: Black/ African American (N = 709)	Race: Other (N = 221)
Reporting error in height	Overall	$.23^{**}$	$.29^{**}$	$.26^{**}$
	Males	$.23^{**}$	$.19^{*}$	.19
	Females	$.23^{**}$	$.33^{**}$	$.29^{**}$
Reporting error in weight	Overall	$.13^{**}$	$.11^{*}$	.12
	Males	$.10^{**}$	.01	.11
	Females	$.15^{**}$	$.16^{**}$	.13

Note. * $p < .05$, ** $p \leq .001$, Other = American Indian, Alaskan Native, Asian, Native Hawaiian, Pacific Islander

A multiple regression was performed to investigate whether age, gender and race could significantly predict the reporting error in height. The results of the regression (Table 2.11) indicated that the model explained only 7.6% of the variance. Age (*B* = 0.02, $p < .001$) and gender (*B* = -0.31, $p < .001$) contributed significantly to the model; controlling for other variables, older individuals and males had higher overreporting of height. The reporting error in height (overestimation) was greater for the individuals of other races than the White category (*B* = 0.17, $p = .02$). No significant difference was found between White and Black/ African American groups.

Table 2. 11. *Multiple regression analysis for predicting reporting error in height*

Variable	*B*	*SE B*	β
Constant	-0.30	0.10	
Age	0.02	0.001	0.24^{**}
Gender	-0.31	0.03	-0.14^{**}
White vs. Black	0.07	0.04	0.02
White vs. Other	0.17	0.07	0.03^{*}

Note. Adjusted $R^2 = 0.076$, $^{*}\ p < .05$, $^{**}\ p < .001$

A multiple regression was also performed to investigate whether age, gender and race could significantly predict the reporting error in weight. The results of the regression (Table 2.12) indicated that the model explained only 2.8% of the variance. Age (*B* = 0.08, $p < .001$) and gender (*B* = -1.09, $p < .001$) contributed significantly to the model; controlling for other variables, older individuals and males had less underreporting of weight. The reporting error in weight (underestimation) was less for the Black/ African American than the White individuals (*B* = 1.62, $p < .001$), and for the individuals of other races than the White individuals (*B* = 2.18, $p < .001$).

Table 2. 12. *Multiple regression analysis for predicting reporting error in weight*

Variable	*B*	*SE B*	β
Constant	-6.74	0.64	
Age	0.08	0.01	0.12^{**}
Gender	-1.09	0.18	-0.08^{**}
White vs. Black	1.62	0.26	0.08^{**}
White vs. Other	2.18	0.45	0.06^{**}

Note. Adjusted $R^2 = 0.028$, $^{**}\ p < .001$

Discussion

The present study aimed to examine the differences between self-reported and measured height and weight and investigate the role of gender and age in relation to the accuracy of self-reports in a representative sample of older adults and their partners of any age from the Health and Retirement Study (HRS). A particular strength of the study was the representativeness of the sample of Americans over the age of 50. Another strength was the fact that self-reports and measurements were collected within a few hours, and therefore the reporting errors could not be associated with environmental or time factors. Importantly, respondents were not aware that they would be measured when they self-reported their height and weight. Exclusion criteria were adhered to, since participants who wore shoes, were measured on high-pile carpet, or were not compliant during height and weight measurements were excluded from the analysis. Separate analyses excluding participants under age 60, examining a quadratic term, and calculating the effect size of the differences were also performed.

First, the results suggest that there were differences between self-reports and measurements of height and weight in this sample. On average, participants overestimated their height with medium to large effect sizes, and underestimated their weight with small to medium effect sizes. The mean reporting errors in height and weight were significantly different from zero. Our findings are consistent with previous studies that support the overestimation of height and underestimation of weight in older adults (Cawley et al., 2017; Gunnell et al., 2000; Kuczmarski et al., 2001).

Second, consistent with previous findings we found that both older males and females overestimated their height (Cawley et al., 2017). It has been suggested that older adults may misreport their height due to the fact that they may not be aware about the changes in their height as they get older, or they may remember their height as measured at a younger age (Gunnell et al., 2000; Kuczmarski et al., 2001). In line with previous studies (Gunnell et al., 2000; Kuczmarski et al., 2001), we also found that the reporting error in height was on average larger for males than females, with a small effect size. Possible reasons could be that males may not acknowledge the extent of height shrinkage, as they get older. In contrast, females may be more aware about these changes due to the diagnosis of osteoporosis, which is more common in women and is significantly associated with height loss (Craig & Adams, 2009).

Our findings also suggest that both sexes underestimated their weight, and are consistent with the general trend that individuals tend on average to underreport their weight (Gorber et al., 2007). In addition, we found that the reporting error in weight was on average larger in absolute value for females than males, with a small effect size. These results are broadly consistent with previous findings that support that younger and older females tend to underestimate their weight more than males (Gil & Mora, 2011; Gunnare et al., 2013; Cawley et al., 2017). Several hormonal and environmental changes emerge in women during menopause. Due to these changes, weight gain is very common in females during this period (Kozakowski, Gietka-Czernel, Leszczynska, & Majos, 2017). Older females may underestimate their weight more than older males due to the increase of their body weight. It is unclear whether misreporting of weight is related to the fact that females recall their weight as measured in earlier years, and as the weight gain is common as they age, the difference between self-reported and actual weight is not negligible, or if it is related to other factors.

The nature of the sample permitted the implementation of age differences between younger and older Americans in regards to the reporting error in height and weight. Our findings are consistent with previous studies (Cawley et al., 2017; Kuczmarski et al., 2001) and suggest that the overestimation of height was in general larger in older age groups. Not surprisingly, the reporting error in height was more pronounced among the older than the younger participants, as the height loss is greatest in older adults (Gunnell et al., 2000). Older adults may not be aware about the extent of height loss resulting from ageing, or they may remember their height as measured in earlier years (Cawley et al., 2017; Yong & Saito, 2012).

A different pattern is evident for the reporting error in weight as participants get older. Consistent with a recent study (Cawley et al., 2017), our findings showed that the underreporting of weight tends to be less pronounced as individuals get older. Factors such as social desirability or pressure to achieve a thin body may be less relevant among older compared to younger Americans, as well as the reluctance to reveal body weight may decrease with age (Cawley et al., 2017; Craig & Adams, 2008; Yong & Saito, 2012). However, this finding should be interpreted with caution, as this relationship was very weak.

We also examined the reporting errors in height and weight separately for the BMI categories. The results of the study indicated age and gender had the same relationships as before: older individuals and males overestimate their height more than young-old and females respectively. Older individuals and males underestimate their weight less than young-old and females respectively. Dummy variables for BMI categories revealed that obese individuals overestimate their height more than the normal weight individuals. Further, overweight individuals underestimate their weight more than normal weight individuals, and obese individuals underestimate their weight even more compared to normal weight individuals. Underweight individuals overestimate their weight more compared to normal weight individuals. These results are in line with the general trend suggesting that individuals with higher BMI tend to underreport their weight more than those with lower BMI (Ambwani & Chmielewski, 2013).

When dummy variables were introduced for race categories, age and gender had similar prediction coefficients as before. It was also found that individuals of other races (i.e., American Indian, Alaskan Native, Asian, Native Hawaiian, and Pacific Islander) overestimate their height more than Whites, possibly due to the differences in anthropometrics between races. In addition, the underestimation of weight was less for Black/ African Americans and individuals of other races than Whites. These results could be possibly explained by the racial differences regarding the ideal body, as Whites tend to place more emphasis on thinness relative to other races (Vaughan, Sacco, & Beckstead, 2008).

Overall, the present study examined the differences between self-reports and actual measurements of height and weight and the role of gender and age in the accuracy of self-reports among a representative sample of older Americans. The findings of the study indicated that on average participants overestimated their height, with medium to large effect sizes and underestimated their weight, with small to medium effect sizes. Males overestimated their height more than females, and females underestimated their weight more than males, with small effect sizes. The overestimation of height was found to be larger, and the underestimation of weight to be less pronounced as individuals get older. The change with age was in most cases linear, as the analysis also looked at quadratic trends.

The study has some limitations. First, these data were collected over a decade ago (i.e., at the first time that the enhanced-face-to-face interview was administered), when participants had been unaware about the upcoming measurements of height and weight. The data may not fully describe how older adults perceive their height and weight in recent years, where they may be affected by the societal pressures related to physical appearance, youth and thinness ideals as presented in the media. Second, the age groups 30 - 39 years and 40 - 49 years old are not representative of the general population, and therefore the results of these groups should be interpreted with caution. Lastly, even though the sample was representative, due to design issues and missing values, only subsamples were used in the analyses. The excluded cases differed from selected cases in terms of age and gender. Therefore, the overall estimates for Americans should be interpreted with caution.

The present study suggests that older adults are not very accurate reporters of their height, with medium to large effect sizes. A smaller effect of error in weight reporting was also found. These findings were found in a research context, but this is likely to be the case in the context of self-monitoring of health conditions, or in reports to health professionals. Whenever possible, and despite the costs, researchers and health professionals should measure the height and weight of older adults and take into consideration the reasons for misreporting in this population. As the population is ageing globally, there is a need for accurate height and weight information when assessing and monitoring health in later life. Otherwise, the reliance on inaccurate self-reports of height and weight may lead to misleading assessment and management of health conditions that are serious and common in older adults, including osteoporosis, diabetes or cardiovascular diseases (Gutzwiller et al., 2018).

Chapter 3

Study 2: The differences between self-reports and measurements of weight in the Longitudinal Internet Studies for the Social Sciences Panel

Introduction

Research on health and health behaviours often relies on self-reports of height and weight for practical and financial reasons (Bolton-Smith et al., 2000). Nevertheless, some previous studies have documented large differences between self-reported and objectively measured height, weight and Body Mass Index (BMI). Such studies usually report underestimation for weight and BMI and overestimation for height, with the degree of underestimation or overestimation exhibiting great variability at the individual level (Gorber et al., 2007).

The gender of individuals appears to play a role in misreporting of weight, with previous studies suggesting that females exhibit a higher degree of underestimation compared to males (Gil & Mora, 2011; Gunnare, Silliman, & Morris, 2013). Possible reasons could be the greater emphasis that females give on thinness and the pressure they may perceive to conform to cultural norms for appearance (Polivy, Herman, Trottier, & Sidhu, 2014).

Misreporting of weight relates to BMI classification, with previous studies supporting that individuals with higher BMI tend to underreport their weight (Ambwani & Chmielewski, 2013; Gunnare et al., 2013). Possible reasons could be that they are more dissatisfied with their bodies (Goldfield et al., 2010), are less likely to weigh themselves (Lawlor, Bedford, Taylor, & Ebrahim, 2002), or desire to appear thinner influenced by societal norms (Larson, 2000). Normal weight individuals were found to report their weight more accurately than obese individuals, by underestimating their weight by an average of 0.20 kg compared to an average of 2.50 kg respectively (Burton, Brown, & Dobson, 2010). This finding may reflect “a social desirability bias towards low weight” (Burton et al., 2010, p. 622). It was also found that those with BMI below 18.5 kg/m² tend to overestimate their weight (Mathew et al., 2012), potentially influenced by societal norms for ‘ideal’ weight of being slim but not too skinny (Larson, 2000).

The age of individuals also seems be associated with their weight reporting, with some previous studies documenting that older adults tend to underestimate their weight (Gunnell et al., 2000; Kuczmarski et al., 2001). Possible reasons of misreporting may be memory problems (Dahl et al., 2010) or unawareness of changes in their bodies with ageing (Gunnell et al., 2000). Some previous findings support that older females underestimate their weight more than older males (Maclean & Kessler, 2015), and others that older males underestimate more than older females (Pasalich et al., 2013; Yong & Saito, 2012). Although older adults appear to underestimate their weight, when younger and older ones were compared, there is additional evidence that the underestimation of weight was greater among the younger ones (Cawley et al., 2017).

It has been found that individuals who weigh themselves often, estimate their weight more accurately than those who do not (Gunnare et al., 2013; Imrhan et al., 1996; De Vriendt, Huybrechts, Ottevaere, Van Trimpont, & De Henauw, 2009). Flood, Webb, Lazarus and Pang (2000) found that females who weighed themselves at least once a month were more accurate reporters of their weight compared to those who weighed themselves less frequently. Among males, differences between those who weighed themselves frequently or non-frequently were not statistically significant. Gunnell and colleagues (2000) did not find strong evidence that recent measurements of height and weight increased the accuracy of self-reporting in older people.

To sum up, it is important to identify the factors that affect the accuracy of self-reports and the extent of this inaccuracy as it appears to have a large effect on the estimates of the prevalence of obesity and other health conditions (Gunnare et al., 2013).

Obtaining objective measures for height and weight is one way to deal with the inaccuracy of self-reports. The World Health Organization (2000) strongly suggests the use of objective measures instead of self-reports of height and weight, highlighting the fact that self-reports are not reliable. Recent technological advances could help researchers collect objective measures easily and timely, with low cost, higher quality and no geographical limitations (Kooreman & Scherpenzeel, 2014). The development of online surveys and panels could certainly help researchers collect objective measures for height and weight from representative samples of the general population as well as to assess these anthropometric measurements at different points in time.

Purpose of the study. This study aims to examine the differences between self-reported and measured weight, and whether these differences relate to demographic factors such as gender, BMI, and age. In addition, this research aims to investigate whether participants become more or less accurate reporters of their weight after a year of participating in a study that requires regular weight measurements. For the present secondary analysis, data from the Longitudinal Internet Studies for the Social Sciences (LISS) panel administered by CentERdata (Tilburg University, The Netherlands) were used. The research questions and hypotheses of the study were as follows:

1. Are there any differences between self-reports and measurements of weight?

- It is hypothesised that on average participants will underestimate their weight.

2. What is the extent of these differences in males and females, in underweight, normal weight, overweight and obese individuals, and in younger and older adults?
    - It is hypothesised that females will underestimate their weight more than males, those with higher BMIs will underestimate it more than those with lower BMIs, and younger adults will underestimate it more than older adults.
3. Will weight reporting accuracy change after a year of participating in a study requiring frequent measurements of weight? Will these tendencies in reporting accuracy be different for males versus females, and for younger versus older participants?
    - It is hypothesised that participants will report their weight more accurately after frequent measurements of weight.

Method

The Longitudinal Internet Studies for the Social Sciences (LISS) Panel. The LISS panel is a representative sample of Dutch individuals who participate in monthly Internet surveys (Kooreman & Scherpenzeel, 2014; Scherpenzeel, 2017). It is operated by CentERdata (Tilburg University, The Netherlands). The panel is based on a true probability sample of households drawn from the population register by Statistics Netherlands. Households that could not otherwise participate are provided with a computer and Internet connection. A longitudinal survey is fielded in the panel every year, covering a large variety of domains including work, education, income, housing, time use, political views, values and personality. Participants get €7.50 per half hour of interview time (Kooreman & Scherpenzeel, 2014).

Panel members were invited to participate in the LISS Weighing Project, a longitudinal study that lasted three years (Scherpenzeel, 2017). They were informed that only a limited number of weighing scales were available and that a random sample of panel members would receive a scale. According to Scherpenzeel (2017), “this scarcity principle was assumed to increase the willingness to participate” (p.31). Instruction videos were given in the invitation to inform the members about their participation and to minimise the chances of refusals because of the respondents’ fear of not being able to install the scale and connect it to the Internet (Scherpenzeel, 2017). About 1000 households were randomly selected, in which at least one member was willing to participate. For logistic reasons the scales were distributed in several batches during the first quarter of 2011, and as a result the date of the first measurement varied across participants (Kooreman & Scherpenzeel, 2014; Scherpenzeel, 2017). Those who were not selected were thanked via email and explanations were given about the limited number of scales and the high number of volunteers (Kooreman & Scherpenzeel, 2014; Scherpenzeel, 2017).

Participants were provided with an advanced device that measures body weight, and wirelessly sends the information to the LISS database. This procedure minimises the role of the participants in transferring information. They were instructed to step on the scale without shoes and always at the same time of the day, wearing similar clothes. Researchers randomised the frequency with which participants were requested to step onto the scale (i.e., once a day, once a week, or unspecified) (Kooreman & Scherpenzeel, 2014). Weight was measured to the nearest 0.1 kg. Participants also provided self-reports of their weight about 1 to 2 months (some participants in November 2010 and some in December 2010) before the Weighing Project was implemented, as part of a questionnaire on health. For height, there were only self-reported values (Kooreman & Scherpenzeel, 2014). Panel members were asked the following questions: “How tall are you?” (in cm) and “How much do you weigh, without clothes and shoes?” (in kilos). At that point, respondents were not aware about the upcoming actual measurements of weight.

Secondary data analysis procedure. To gain access and permission to use the data of the LISS Panel, a statement concerning the use of the data was completed and signed. Then, a personal ID and password was obtained for downloading the datafiles.

Data from the Core Study Health (Wave 4) were downloaded from the LISS website (www.lissdata.nl). In Wave 4, self-reported height and weight data were collected in November 2010. The questionnaire was repeated in December 2010 for those that had not completed it in November 2010 (Vis, 2011).

Data from the Weighing Project were also downloaded from the website. The Weighing Project collected objective measurements of weight. For the purpose of the present secondary analysis, measured weight data collected at the beginning of the Weighing Project (i.e., January 2011) were selected (Kooreman & Scherpenzeel, 2014).

A new data file (N = 365) was created after merging the files with self-reported and measured weight of the same participants. It is important to note that the researchers did not distribute all the 1000 scales at once. Specifically, the datafile of January 2011 includes the measurements of 371 participants. Due to the fact that six cases were missing from Wave 4, the final file that was used for the present analysis ended up with 365 participants. The frequency with which each participant stepped onto the scale varied. To avoid reactivity on behalf of the participants, it was decided to use only the first measurement of each participant for the analysis. Height measurements were not included in the analysis, as there were no objective measurements of height. For the calculation of the BMI categories, the self-reported height and measured weight were used.

To examine the change in the reporting error in weight after a year of participating in the study, self-reported and measured weight values of the same participants, collected in 2010 (T1) and a year later (T2) were compared. As described above, for T1, self-reported data were collected in November 2010 (Core Study Health - Wave 4) and measured data in January 2011 (Weighing Project). It is important to note that participants were measured in January 2011 for the first time. For T2, self-reported (Core Study Health - Wave 5) and measured data (Weighing Project) were collected in November 2011.

Sample. A total of 365 participants (N_{males} = 183, N_{females} = 182) aged 16 to 88 years (M = 50.49, SD = 15.33) self-reported and measured their weight (in kilograms) and were analysed to examine the reporting error in weight for T1. A total of 255 participants (N_{males} = 127, N_{females} = 128) aged 16 to 86 years (M = 52.39, SD = 14.61) at T1 were also analysed to examine the reporting error in weight after a year of participating in the study. In total 110 cases were lost from T1 to T2: 33 cases that were present at T1 had a missing ID at T2, and 77 cases had one missing weight measurement or self-report at T2. Fifty-five of them were males and 55 were females, and their age ranged from 18 to 89 years (M = 46.43, SD = 16.04).

We compared those who were selected and had their first measurement in January 2011 (N = 365) vs. those that had their first measurement in the following months to check whether they differed in terms of age and gender. A total of 532 respondents (N_{males} = 258, N_{females} = 274) with an average age of 49.52 years (SD = 15.98) were not included in the analysis. Respondents that were selected did not significantly differ from those that were not included in terms of age, $t(895) = -0.90$, $p = .37$, $d = 0.06$, and gender, $\chi^2\,(1) = 0.23$, $p = .63$. Their characteristics are presented in Table 3.1.

Table 3. 1. *Characteristics for selected vs. not selected respondents*

Variable	Not selected (N = 532) *M (SD)* or %	Selected (N = 365) *M (SD)* or %
Age	49.52 (15.98)	50.49 (15.33)
Gender	51.5% females	49.9% females

Statistical analysis. We calculated the reporting error for weight using the following formula:

$$\text{Reporting Error}_i = \text{Self-reported weight}_i - \text{Measured weight}_i \quad (3.1)$$

for each individual *i*. Cohen's *d* was used to evaluate the differences, with the values of 0.2, 0.5 and 0.8 indicating small, medium and large effect sizes respectively (Cohen, 1992). Independent samples *t*-tests were performed for gender differences. Hierarchical multiple regressions were performed to examine quadratic relations. Pearson's *r* correlations were also conducted for the reporting error in weight with age and BMI. BMI was calculated from self-reported height (measured height was not collected) and measured weight for each participant, with the following formula:

$$\text{BMI}_i = \frac{\text{weight (in kg)}}{\text{height}^2 \text{ (in cm)}} \times 10000 \quad (3.2)$$

for each individual *i* (Centers for Disease Control and Prevention, 2014). Individuals were categorised as underweight (BMI <18.5 kg/m^2), normal weight (BMI 18.5 - 24.9 kg/m^2), overweight (BMI 25 - 29.9 kg/m^2), and obese (BMI ≥30.0 kg/m^2). Paired samples *t*-test was performed to compare the reporting error in weight in 2010 and a year later for males and females, as well as Pearson's *r* correlations to examine the relation between the reporting error in weight and age at T2.

Results

Descriptives. Table 3.2 presents descriptive statistics for the main variables. The mean measured weight was 79.88 kg, which is about 1.5 kg higher than the mean self-reported weight of 78.27 kg. The mean reporting error for the overall sample was -1.61 kg.

A histogram indicated that there were some outliers for the reporting error in weight. Four cases with reporting error | *z*-scores | > 3 were flagged as outliers. Three of these cases underreported weight (by -14.2, -26.8, -33.8 kg) and the other case overreported weight (by 9 kg). All four cases were females. The mean reporting error for the sample excluding the four outliers was -1.45 kg.

One sample t-tests. One sample *t*-tests (two-tailed) indicated that participants on average underreported their weight. The reporting error in weight was significantly different from zero for the overall sample, $t(364) = -8.99$, $p < .001$, $d = -0.47$; for the overall sample (excluding outliers), $t(360) = -10.85$, $p < .001$, $d = -0.57$; for males, $t(182) = -7.48$, $p < .001$, $d = -0.55$; for females, $t(181) = -5.91$, $p < .001$, $d = -0.44$; and for females (excluding outliers), $t(177) = -7.86$, $p < .001$, $d = -0.59$[14]. The *d* values indicated medium effect sizes for the difference of the reporting error from zero in all samples.

To sum up, participants on average underestimated their weight and the reporting error in weight was significantly different from zero with medium effect sizes for the overall sample and subgroups.

Table 3. 2. *Descriptive statistics for the main variables (N = 365)*

Variable	*N*	Range	Mean *(SD)*	Skewness *(SE)*	Kurtosis *(SE)*
Age	365	16 - 88	50.49 (15.33)	-0.07 (0.13)	-0.64 (0.26)
Measured weight	365	47.40 - 129.70	79.88 (16.02)	0.60 (0.13)	0.14 (0.26)
Self-reported weight	365	50 - 127	78.27 (15.30)	0.54 (0.13)	-0.03 (0.26)
Reporting error (kg)					
Overall	365	-33.8 - 9	-1.61 (3.42)	-3.54 (0.13)	29.04 (0.26)
Overall (excl. outliers)	361	-10.6 - 7.1	-1.45 (2.54)	-0.41 (0.13)	1.38 (0.26)
Males	183	-10.1 - 5.8	-1.43 (2.59)	-.051 (0.18)	1.13 (0.36)
Females	182	-33.8 - 9	-1.80 (4.09)	-3.97 (0.18)	27.61 (0.36)
Females (excl. outliers)	178	-10.6 - 7.1	-1.47 (2.49)	-0.29 (0.18)	1.77 (0.36)

Reporting error and gender differences. An independent samples *t*-test indicated that the difference between males and females was not significant, $t(363) = 1.01$, $p = .31$[15]. Similarly, after excluding the 4 outliers, the difference was not significant $t(359) = 0.13$, $p = .90$[16].

Overall, no significant gender differences were found on the mean reporting error in weight including and excluding the outliers.

Reporting error and BMI[17]differences. Table 3.3 presents descriptive statistics for the underweight, normal weight, overweight and obese individuals. The mean measured weight was higher compared to self-reported weight for all BMI categories, apart from the underweight participants. One sample *t*-tests (two-tailed) indicated that the reporting error

[14] One-tailed one-sample *t*-tests were also performed to test if the reporting error in weight is significantly different from zero, and the results were very similar.

[15] A Mann-Whitney Test also indicated that this difference was not significant, $U = 16100.5$, $Z = -.55$, $p = .58$.

[16] A Mann-Whitney Test also indicated that this difference was not significant, $U = 15917.5$, $Z = -.37$, $p = .71$.

[17] BMI was calculated from self-reported height and measured weight.

in weight was significantly different from zero for the normal weight individuals, $t(160) = -4.95$, $p < .001$, $d = -0.39$; for the overweight $t(132) = -7.60$, $p < .001$, $d = -0.66$; for the overweight (excluding outliers), $t(131) = -8.50$, $p < .001$, $d = -0.74$; for the obese, $t(62) = -4.96$, $p < .001$, $d = -0.62$, and for the obese (excluding outliers), $t(59) = -6.49$, $p < .001$, $d = -0.84$. The reporting error in weight was not significantly different from zero for the underweight participants, $t(7) = 1.68$, $p = .14$, $d = 0.60$[18]. The *d* values indicated a small effect size for the normal weight individuals, medium effect sizes for the overweight with and without outliers, obese and underweight participants, and a large effect size for the obese individuals excluding outliers.

To sum up, participants in all BMI categories, apart from the underweight individuals, underestimated their weight. The reporting error in weight was significantly different from zero for all BMI categories, apart from the underweight participants.

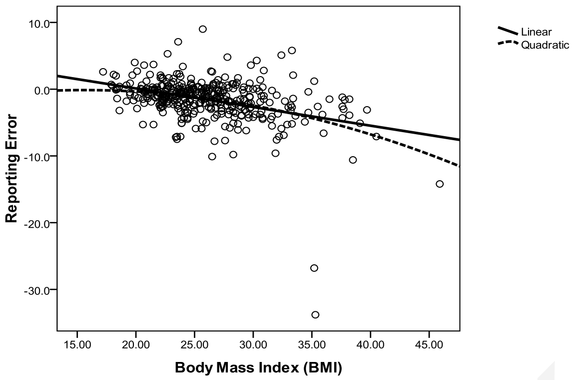
[18] One-tailed one-sample *t*-tests were also performed to test if the reporting error in weight is significantly different from zero for the BMI categories, and the results were similar.

Table 3. 3. *Descriptive statistics for the BMI categories*

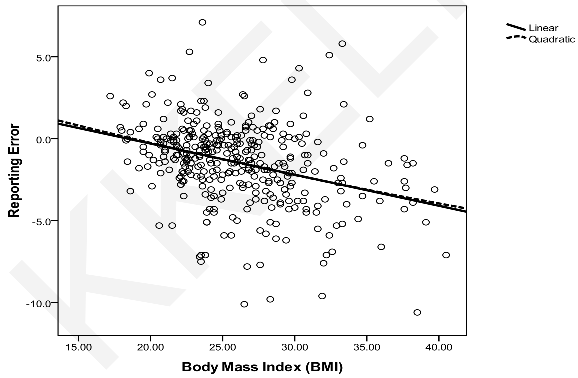
BMI categories	*N*	Outliers	Mean *(SD)* Measured weight	Self-reported weight	Reporting error	Reporting error (excl. outliers)
Underweight	8	0	53.94 (3.92)	54.75 (3.01)	0.81 (1.36)	0.81 (1.36)
Normal weight	161	0	68.82 (8.80)	67.97 (8.88)	-0.85 (2.18)*	-0.85 (2.18)*
Overweight	133	1	84.36 (9.47)	82.68 (9.76)	-1.68 (2.54)*	-1.76 (2.38)*
Obese	63	3	102.02 (12.99)	98.29 (13.09)	-3.74 (5.98)*	-2.68 (3.19)*

Note. *significantly different from zero

Based on previous findings suggesting that the heavier individuals tend to underestimate their weight, thinner individuals to overestimate it, and the normal weight individuals to slightly underestimate it (Ambwani & Chmielewski, 2013; Burton et al., 2010; Mathew et al., 2012), we examined the relationship between BMI and the reporting error in weight using both linear and quadratic functions (see Figure 3.1). We also examined this relationship using a cubic function. Adding the cubic term did not improve the *R*-squared greatly as compared to quadratic function, and was not used in the analysis.

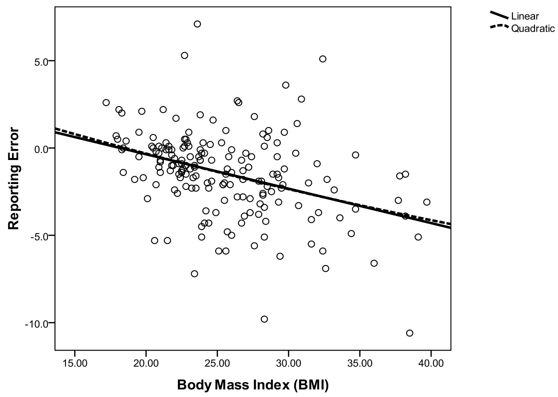


a) Overall sample



b) Overall sample (excluding outliers)

c) Male sample



d) Female sample (excluding outliers)

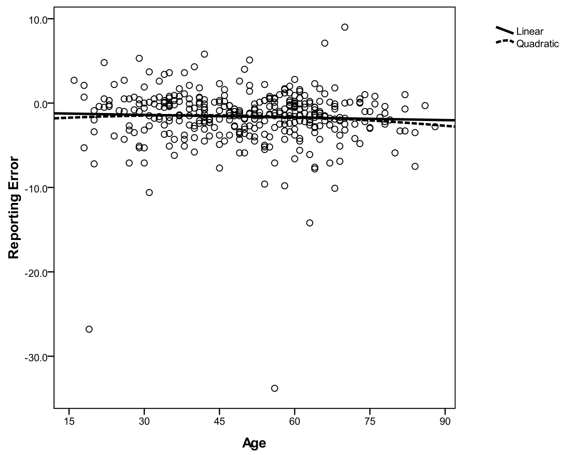
Figure 3. 1. Scatterplots of the reporting error in weight and BMI.

As the visual representation of the data suggests (a) there is more underreporting at higher BMI categories and (b) a straight line may not adequately describe the relationship between the two variables. Hierarchical multiple regressions were conducted with the reporting error in weight as the dependent variable. BMI was entered at stage one (Model 1) of the regression and represented the linear function. A variable that represented the quadratic function was calculated (BMI_squared) and entered at stage two (Model 2).

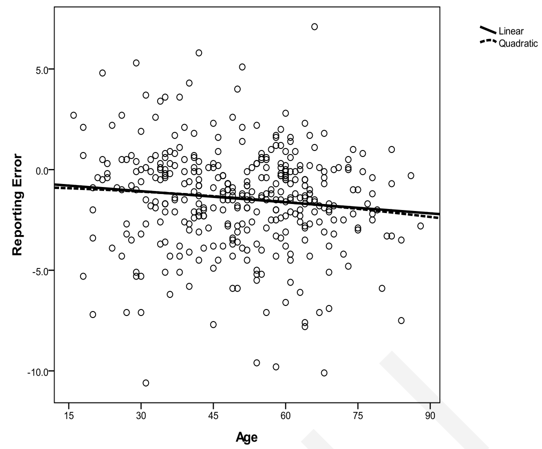
Taken together, the results indicated that adding a quadratic component to the model produced a significant *F* change in the overall sample only when the four outliers were included in the data. This was not the case in the overall sample when the four cases were excluded or when the model was estimated on males and females separately. It can be concluded that the outliers had an effect on the significance value, and that the relationship between BMI and the reporting error for weight can be represented by a linear function (see Appendix E).

Pearson's correlation coefficients were calculated to examine the strength of the relationship. The reporting error in weight and BMI were negatively correlated, Pearson's $r = -.37$, $p < .001$ for the overall sample; $r = -.29$, $p < .001$ for males, and $r = -.43$, $p < .001$ for females. After removing the outliers, the reporting error in weight and BMI were negatively correlated, Pearson's $r = -.33$, $p < .001$ for the overall sample, and $r = -.37$, $p < .001$ for females. The results indicate that participants with higher BMI tend to underestimate their weight more, i.e., larger negative bias, than participants with lower BMI.

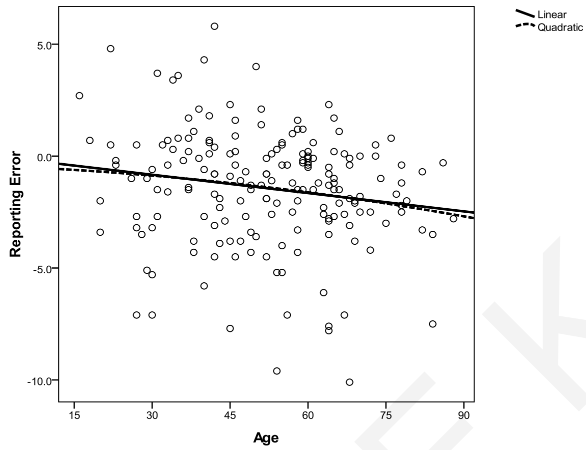
Reporting error and age differences. Previous findings suggest that older adults tend to underestimate their weight (Gunnell et al., 2000). Some studies support that older females underestimate weight more than older males (Maclean & Kessler, 2015) and others that older males underestimate it more than older females (Pasalich et al., 2013; Yong & Saito, 2012). When younger and older adults were compared, there is evidence that the underestimation of weight was greater among the younger ones (Cawley et al., 2017). We examined the relationship between age and the reporting error in weight using both linear and quadratic functions (see Figure 3.2). We also examined this relationship using a cubic function. Adding the cubic term did not improve the *R*-squared greatly as compared to quadratic function, and was not used in further analysis.



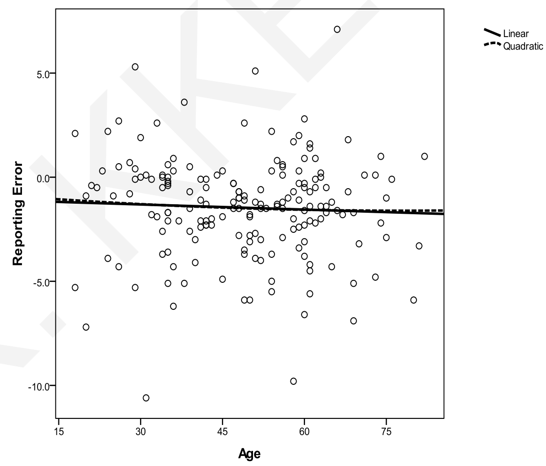
a) Overall sample



b) Overall sample (excluding outliers)



c) Male sample



d) Female sample (excluding outliers)

Figure 3. 2. Scatterplots of the reporting error in weight and age.

As can be seen in Figure 3.2, a non-linear relation between age and the reporting error in weight cannot be detected graphically. Nevertheless, we proceeded with hierarchical multiple regressions to test it statistically. Hierarchical multiple regressions were conducted with the reporting error in weight as the dependent variable. Age was entered at stage one (Model 1) of the regression and represented the linear function. Age_squared variable was calculated, entered at stage two (Model 2) and represented the quadratic function.

As there were no quadratic relations between age and the reporting error in weight in the sample (see Appendix F), the strength of the relations was examined with Pearson's r correlations. Age and the reporting error in weight were not significantly correlated, Pearson's r = -.05, p = .38 for the overall sample; r = .03, p = .74 for females; and r = -.05, p = .53 for females (excluding outliers). Age and the reporting error in weight have a weak negative correlation, $r = -.17$, $p = .02$ for males; and $r = -.11$, $p = .04$ for the overall sample (excluding outliers). The results indicate that the underreporting of weight tends to be slightly larger as individuals, and specifically males, get older.

Comparison of the reporting error in Time 1 (T1) and Time 2 (T2)

For comparing the reporting error in weight in T1 and T2, data from participants who had self-reported and actual weight data at both time points were used ($N = 255$).

Descriptives. Table 3.4 presents descriptive statistics for the main variables. Both T1 and T2 reporting error averages were significantly different from zero: one sample *t*-test for T1, $t(254) = -8.70$, $p < .001$, $d = -0.54$, and one sample *t*-test for T2 data, $t(254) = -7.56$, $p < .001$, $d = -0.47$, indicating medium effect sizes.

The analysis was repeated excluding the outliers. Six cases with reporting error | *z*-scores | > 3 were flagged as outliers. Two of these cases had reporting error | *z*-scores | > 3 in both T1 (by -10.1, 7.1 kg) and T2 (by -7.7, 6.5 kg). The other two cases had reporting error | *z*-scores | > 3 in T1 (by -14.2, 9.0 kg) and the other two in T2 (by -9.4, -9.1 kg). Five out of six cases were females. One sample *t*-tests showed that the reporting error in weight was significantly different from zero, for T1, $t(248) = -9.78$, $p < .001$, $d = -0.62$, and for T2, $t(248) = -9.17$, $p < .001$, $d = -0.58$, indicating medium effect sizes.

Paired-samples t-tests. There was a significant difference in the reporting error in weight in T1 ($M = -1.40$, $SD = 2.57$) and T2 ($M = -0.67$, $SD = 1.42$), $t(254) = -4.29$, $p < .001$, $d = -0.27$. A paired-samples *t*-test was also performed excluding the 6 outliers. There was a significant difference in the reporting error in weight in T1 ($M = -1.39$, $SD = 2.25$) and T2 ($M = -0.60$, $SD = 1.03$), $t(248) = -5.26$, $p < .001$, $d = -0.33$. The results indicate on average more accurate reporting in T2 than T1. The *d* values indicated small effect sizes for the difference in the reporting error from T1 to T2.

Correlation of the reporting error in T1 and T2. Figure 3.3 illustrates the relationship between the reporting error in weight in T1 and T2. The reporting error in weight in T1 was positively correlated with that in T2, Pearson's $r = .18$, $p = .003$, indicating a weak positive association. After removing the 6 outliers, the association was no longer significant, $r = .10$, $p = .14$.

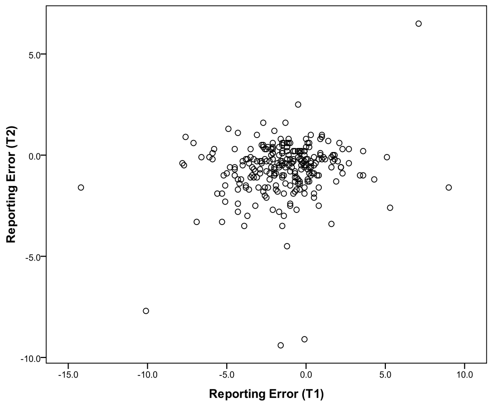


Figure 3. 3. Scatterplot of the relationship between the reporting error in T1 and T2.

Reporting error and gender differences. Paired-sample *t*-tests were performed to compare the reporting error in weight in T1 and T2 separately for males and females. There was a significant difference in the reporting error in weight in T1 (M = -1.41, SD = 2.38) and T2 (M = -0.68, SD = 1.16), $t(126) = -3.26$, $p = .001$, $d = -0.29$ for males. There was also a significant difference in the reporting error in weight in T1 (M = -1.39, SD = 2.75) and T2 (M = -0.67, SD = 1.65), $t(127) = -2.83$, $p = .005$, $d = -0.25$ for females. The reporting error in weight decreased in absolute value from T1 to T2 for both males and females. The *d* values indicated small effect sizes for the difference of the reporting error from T1 to T2 in males and females.

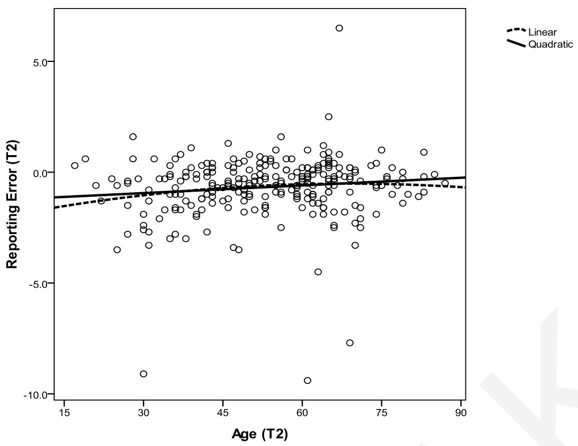
Similarly after excluding the outliers, there was a significant difference in the reporting error in weight in T1 (M = -1.34, SD = 2.25) and T2 (M = -0.62, SD = 0.98), $t(125) = -3.18$, $p = .002$, $d = -0.28$ for males. There was also a significant difference in the reporting error in weight in T1 (M = -1.44, SD = 2.24) and T2 (M = -0.57, SD = 1.08), $t(122) = -4.36$, $p < .001$, $d = -0.39$ for females. The reporting error in weight also decreased from T1 to T2 for both males and females. The *d* values also indicated small effect sizes for the difference of the reporting error from T1 to T2 in males and females.

To sum up, the reporting error in weight was smaller (in absolute value) in T2 for the overall group, males and females. After almost a year of frequent measurements of weight, participants appear to become more accurate reporters of their weight, i.e., underestimate their weight less in T2 compared to T1.

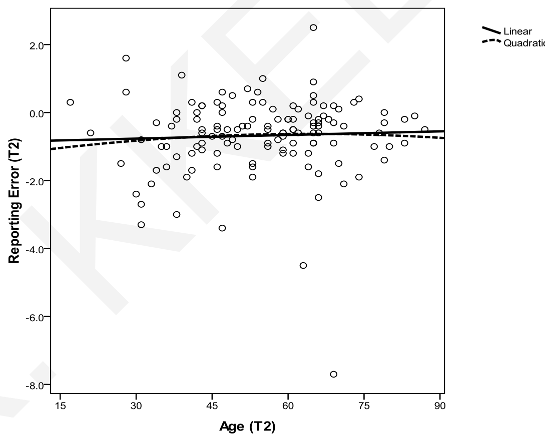
Table 3. 4. *Descriptive statistics for the main variables in T1 and T2*

Variables	*N*	Mean (*SD*)		Range		Skewness *(SE)*		Kurtosis *(SE)*	
		T1	T2	T1	T2	T1	T2	T1	T2
Measured weight	255	79.39 (15.28)	78.33 (14.26)	50 - 128.20	50.3 - 128.6	0.58 (0.15)	0.53 (0.15)	0.27 (0.30)	0.30 (0.30)
Self-reported weight	255	78 (14.63)	77.63 (14.11)	52 - 123	50 - 127	0.50 (0.15)	0.51 (0.15)	0.04 (0.30)	13.71 (0.30)
Reporting error (kg)									
Overall	255	-1.40 (2.57)	-0.67 (1.42)	-14.2 - 9	-9.4 - 6.5	-0.36 (0.15)	-1.89 (0.15)	3.63 (0.30)	13.71 (0.30)
Males	127	-1.41 (2.38)	-0.68 (1.16)	-10.1 - 4.3	-7.7 - 2.5	-0.73 (0.22)	-2.10 (0.22)	1.44 (0.43)	10.81 (0.43)
Females	128	-1.39 (2.75)	-0.67 (1.65)	-14.2 - 9	-9.4 - 6.5	-0.12 (0.21)	-1.73 (0.21)	4.77 (0.43)	12.64 (0.43)
Overall (excl. outliers)	249	-1.39 (2.25)	-0.60 (1.03)	-7.8 - 5.3	-4.5 - 2.5	-0.19 (0.15)	-0.69 (0.15)	0.56 (0.31)	1.03 (0.31)
Males (excl. outliers)	126	-1.34 (2.25)	-0.62 (0.98)	-7.8 - 4.3	-4.5 - 2.5	-0.49 (0.22)	-0.69 (0.22)	0.74 (0.43)	2.44 (0.43)
Females (excl. outliers)	123	-1.44 (2.24)	-0.57 (1.08)	-6.9 - 5.3	-3.5 - 1.6	0.12 (0.22)	-0.70 (0.22)	0.51 (0.43)	0.10 (0.43)

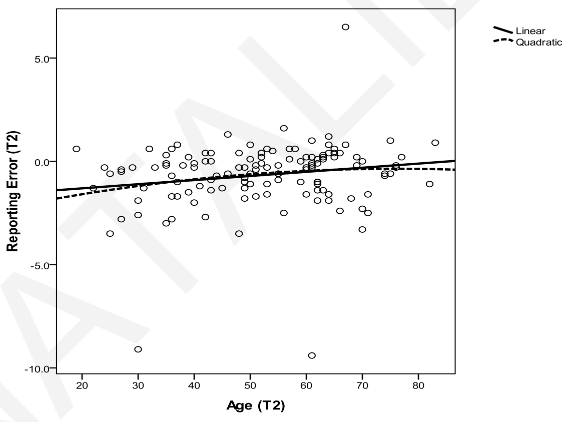
Reporting error and age differences. It was previously found that the underestimation of weight tends to be slightly larger as individuals, and particularly males, get older in T1. We now examine the relation between the reporting error in weight and age in T2, after frequent measurements of their weight. As shown in Figure 3.4, the relation between age and the reporting error in weight in T2 was represented by both linear and quadratic functions. We also examined this relationship using a cubic function. Adding the cubic term did not improve the *R*-squared greatly as compared to quadratic function, and was not used in the analysis.



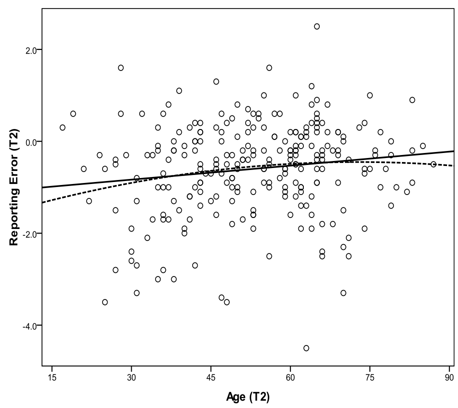
a) Overall sample



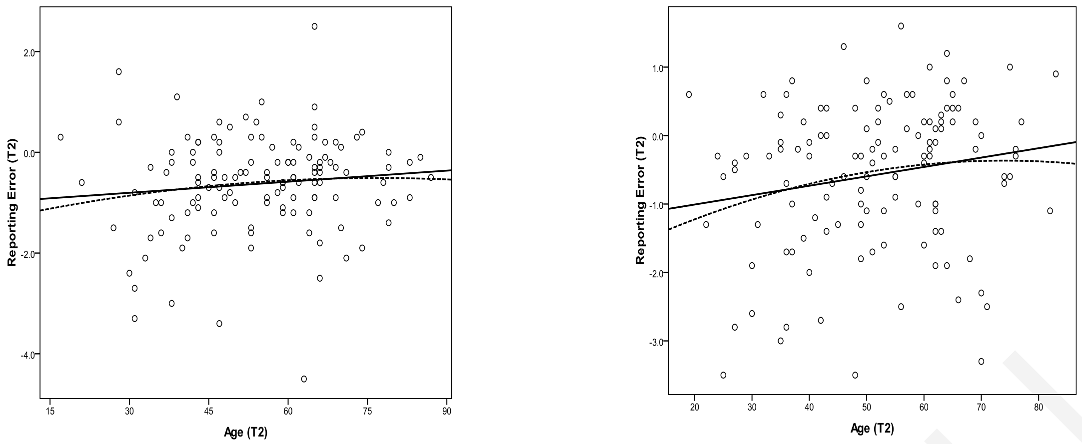
b) Male sample



c) Female sample



d) Overall sample (excluding outliers)



e) Male sample (excluding outliers)   f) Female sample (excluding outliers)

Figure 3. 4. Scatterplots of the reporting error in weight and age at T2.

Hierarchical multiple regressions were performed, with the reporting error in weight as the dependent variable, to test if there were non-linear relations between age and the reporting error in weight at T2. Age was entered at stage one (Model 1) of the regression and represented the linear function. Age_squared variable was calculated, entered at stage two (Model 2) and represented the quadratic function.

Overall, the hierarchical multiple regressions revealed no quadratic relations between the reporting error in weight and age at T2 (see Appendix G). Pearson's *r* correlations were performed to examine the strength of these relations. Age and the reporting error in weight were not significantly correlated, $r = .12$, $p = .06$ for the overall sample; $r = .05$, $p = .62$ for males, and $r = .11$, $p = .22$ for males (excluding outliers). The correlation between age and the reporting error in weight was significant for the overall sample (excluding outliers), $r = .14$, $p = .02$; for females (excluding outliers), $r = .18$, $p = .04$, and marginally significant, $r = .18$, $p = .048$ for females. The weak positive association results indicate that after frequent measurements of weight, the underreporting of weight tends to be less pronounced as females, specifically, get older.

Discussion

The present study aimed to examine the differences between self-reported and measured weight and investigate the role of gender, BMI and age in relation to the accuracy of self-reports in a representative sample of Dutch individuals from the LISS Panel. The study also aimed to investigate whether respondents become more or less accurate reporters of their weight after a year of participating in the study requiring frequent measurements of weight, and whether these tendencies are different for males and females, as well as for younger and older participants.

Firstly, the findings of the study provide evidence that there were differences between self-reports and actual measurements of weight in this sample. In general, participants were not accurate reporters of their weight, as their mean self-reported weight was approximately 1.5 kg lower than the mean measured weight. On average, participants underreported their weight and the mean reporting error in weight was significantly different from zero. These findings support the well documented underreporting of weight (Gil & Mora, 2011).

The results of the present study are not consistent with previous studies supporting gender differences in the misreporting of weight, and specifically that females tend to underestimate their weight significantly more than males (Gil & Mora, 2011; Gunnare et al., 2013). The inability to detect any statistically significant gender differences might be explained by the fact that there is an increase in underestimation of weight in males due to the increasing male body dissatisfaction and the prevalence of severe weight and shape control behaviours in recent years (Mitchison, Hay, Slewa-Younan, & Mond, 2014).

In line with previous findings (Ambwani & Chmielewski, 2013; Gunnare et al., 2013), the present study found that individuals with higher BMIs appear to underreport their weight more than those with lower BMIs. It was also found that the mean measured weight was higher than the mean self-reported weight for all BMI categories, apart from the underweight individuals. These findings may be explained by the ‘flat slope syndrome’ (Kuskowska-Wolk, Karlsson, Stolt, & Rössner, 1989; Kuskowska-Wolk, Bergstrom, & Bostrom, 1992). According to this pattern, people tend to underestimate high values and overestimate low values. Overweight and obese people may underestimate their weight more since they might be dissatisfied with their bodies, weigh themselves less frequently, or desire to appear thinner according to societal norms (Goldfield et al., 2010; Gunnare et al., 2013; Larson, 2000; Lawlor et al., 2002). Normal weight individuals may also underestimate their weight, but in a lesser extent compared to overweight and obese individuals, due to their desire to appear thinner according to societal norms (Burton et al., 2010). Underweight people may overestimate their weight due to the fact that they are influenced by societal norms to have an ideal and desirable weight of being slim but not too skinny (Larson, 2000). However, the overestimation of underweight individuals was not significantly different from zero in the present study, possibly due to the small sample size of 8 individuals.

The findings of the study also suggest that the underestimation of weight tends to be slightly larger as individuals, and specifically males, get older. Some previous studies indicated that older adults tend to underreport their weight (Gunnell et al., 2000; Kuczmarski et al., 2001), and also that older males tend to underestimate it more than older females (Pasalich et al., 2013; Yong & Saito, 2012). It is evident that as people get older, there is a decrease in fat-free mass and body water and an increase in body fat (Eveleth et al., 1998). Many older adults and particularly males may not be aware about these changes in their bodies or may recall their weight from earlier years. Possible reasons could be that unlike older males, older females may be more aware about these bodily changes due to the fact that they weigh themselves more regularly, visit their doctors more frequently or due to the occurrence of osteoporosis, which is more common in females and is related, among others, to weight changes (Craig & Adams, 2009; Yong & Saito, 2012).

With regard to the longitudinal component of the study, both males and females became more accurate reporters of their weight after a year of participating in the study that involved frequent weighing. These findings are in line with previous studies, which found that people who weighed themselves more often estimated their weight more accurately (Gunnare et al., 2013; Imrhan et al., 1996; De Vriendt et al., 2009). But, unlike the present study, these previous studies examined weighing frequency using questionnaire responses. The present results are not surprising. It is reasonable to assume that participants may be more aware about their weight values after frequent objective measurements of their weight. An alternative explanation could be that the respondents have realised that the information they have provided about their weight the first time did not carry any negative consequences for them. Consequently, at subsequent times when they were asked to report their weight, there was less motivation to misreport their answers and possibly this was the reason that they underreported less (Uhrig, 2012).

In contrast to Gunnell et al's (2000) findings that there is no strong evidence that recent measurements increase the accuracy of reporting in older adults, we found that after frequent measurements of weight the underreporting of weight tends to be less pronounced as females, specifically, get older. Frequent measurements of weight may help older people to be more aware about their weight values or to remember their body weight more accurately.

The present study has certain limitations. Even though the sample was representative, due to design issues, only a subsample was used in the analyses. We compared those who were selected vs. those who were not selected in the analyses, and found that they did not differ in terms of age and gender. Self-reports of weight were collected one to two months prior to the actual measurements of weight at T1. It is possible that any potential error may be associated to environmental and time factors. Future studies should attempt to collect both self-reports and actual measurements at about the same time. Another limitation of the study was the effect of attrition, as 110 cases were lost from Time 1 to Time 2. Possible causes of the attrition might be the fact that panel members could not be traced or refused to carry on with the study (Scherpenzeel & Das, 2010). Since actual measurements of height were not available, self-reports of height were included for the calculation of the BMI, and consequently their accuracy could not be ensured. Lastly, the BMI is being criticised that it does not take into consideration muscle mass, gender or age differences (Müller, Braun, Enderle, & Bosy-Westphal, 2016; Nuttall, 2015). A new estimator of body fat has been developed recently which takes into account height and waist circumference and indicates individuals' healthy or at risk levels of body fat (Woolcott & Bergman, 2018). It remains to be seen if this new measure will replace BMI as a more appropriate measure of body fat.

The main strengths of the present study are the representative sampling in the original study and the fact that the actual measurements were wirelessly sent to the LISS database and therefore minimised the role of participants in transferring information. The study protocol and methodology were detailed, as researchers instructed all participants to weigh themselves following the same specific guidelines. The analysis had some methodological strengths, such as the inclusion of the longitudinal component, i.e., comparison of the reporting error in weight at T1 and T2, the examination of quadratic terms, and the consideration of effect size of the differences rather than depending only on the significance level.

Overall, the present study investigated the differences between self-reported and measured weight and the role of gender, BMI and age in relation to the accuracy of self-reports among a representative sample of Dutch individuals. The findings of the study suggest that participants on average underreported their weight with medium effect sizes. The underestimation of weight was more pronounced in females than males; although the difference was not significant. Participants with higher BMIs tended to underestimate their weight more than those with lower BMIs with medium and large effect sizes. In addition, the underestimation of weight was more pronounced as individuals, and specifically males, got older. Lastly, after frequent measurements of weight, the reporting error in weight was found to decrease for both males and females with small effect sizes, and the underreporting was less pronounced as individuals, and specifically females, got older. Future studies should examine other factors that might be responsible for the discrepancy between self-reports and measurements of weight, such as when was the last time that participants measured their weight and whether participants exercise regularly. The identified factors of the reporting error in weight should be entered into models and applied to minimise the reporting error (Tsigilis, 2006).

The present study suggests that the reporting error for weight is not negligible in this population. Both researchers and health professionals should consider that specific populations tend to misreport their weight more than others, and whenever possible should collect objective measurements of weight or instruct their participants/ patients to measure their weight more frequently prior to self-reporting. The accurate reporting of weight will help researchers to answer their research questions and also health professionals to monitor and detect health conditions more accurately.

Chapter 4

Study 3: The differences between self-reports and measurements of height and weight among adults with type 1 diabetes and disordered eating symptomatology

Introduction

Diabetes is a chronic condition classified on the basis of aetiology and presentation into three main types, including type 1 diabetes, type 2 diabetes and gestational diabetes (International Diabetes Federation, 2003). Type 1 diabetes is characterised by lack of insulin, emergence of hyperglycemia, and metabolic problems (Atkinson, Eisenbarth, & Michels, 2014). The management of diabetes requires a constant monitoring of calorie and food intake based on insulin dosage. This focus on dietary management places patients with diabetes at an elevated risk of developing eating problems (Hendrieckx, Halliday, Beeney, & Speight, 2019).

Eating disorders and disordered eating behaviours are common in people with type 1 diabetes (Allan, 2015; Markowitz, Lowe, Volkening, & Laffel, 2009). Previous studies revealed a higher prevalence of eating disorders and disordered eating behaviours among adolescents and adults with type 1 diabetes than in healthy age-matched individuals (Jones, Lawson, Daneman, Olmsted, & Rodin, 2000; Neumark-Sztainer, Story, Hannan, & Croll, 2002). Disordered eating behaviours include food restriction, binge eating, and compensatory weight control behaviours, as well as the omission or restriction of insulin (Hendrieckx et al., 2019), that are not frequent or severe to meet the criteria for an eating disorder. Insulin omission or restriction enables them to eat by minimising the impact of excess calories (Merwin et al., 2014; Takii et al., 2008; Weinger & Beverly, 2010). If these symptoms are left untreated, disordered eating behaviours can develop into eating disorders (Hendrieckx et al., 2019). Eating disorders such as anorexia nervosa and bulimia nervosa are more common in those with type 1 diabetes (Philpot, 2013). Eating disorders and disordered eating in patients with type 1 diabetes, especially when they omit or restrict insulin, are associated with severe diabetes-related complications and premature death (Nielsen, 2002). It is unclear why some individuals with type 1 diabetes are at a higher risk of developing eating disorders and disordered eating behaviours. It seems that among other potential risk factors, personality traits such as perfectionism are involved (Ismail, 2008).

The accuracy of self-reports of height and weight among individuals with diabetes has been examined in a few previous studies and the results were inconclusive.

Niedhammer and colleagues (2000) reported that there was no association between the reporting error in height and weight and taking medication for high blood pressure, high cholesterol or high blood sugar. Jeffery (1996) reported that the history of weight-related health conditions such as high blood pressure, heart disease, or diabetes was related to a small degree to weight underestimation in males, but not in females. However, this study did not perform a separate analysis for diabetes. Other findings support that the presence of diabetes was associated with weight overestimation in males, but not in females (Wada et al., 2005). Yiannakoulia and colleagues (2006) found that the presence of diabetes was associated with weight underestimation in both genders. Lastly, it was found that males with diabetes underestimated their weight more than those without diabetes; females had similar findings, although both results were not significant (Bolton-Smith et al., 2000). While disagreement exists regarding height and weight reporting in diabetic patients, the presence of diabetes may affect the validity of self-reported height and weight. It is important to note that in these previous studies, it was not specified whether individuals with diabetes exhibited disordered eating behaviours as well.

The presence of eating disorder symptomatology and reporting error in weight has been investigated in past studies. Non-clinical females who overestimated their weight were more likely to demonstrate disordered eating behaviours than those who either underestimated or accurately reported their weight (Ambwani & Chmielewski, 2013; Conley & Boardman, 2007; Heilbrun & Friedberg, 1990). Those who exhibited disordered eating behaviours seemed to overreport their weight in order to hide their unhealthy weight behaviours and low weights from others, or because of the distorted body image they had, i.e., believing that they were heavier than they really were (Conley & Boardman, 2007). Eating disordered symptomatology did not significantly predict inaccuracy in weight reporting among males (Ambwani & Chmielewski, 2013). To the best of our knowledge, no evidence exists about the presence of disordered eating pathology and the reporting error in height.

Researchers and health professionals often assess height and weight by asking a person to report his or her height and weight. Despite the advantages that this method entails, the accuracy of self-reported height and weight depends on several factors including the respondents' knowledge, their ability to remember them as well as their willingness to report them accurately. The accuracy of self-reported height and weight is specifically important in patients with type 1 diabetes, as their health condition and weight and/or Body Mass Index (BMI) are highly interconnected (Bays, Chapman, & Grandy, 2007; Steinhausen, 2002). In clinical practice, an inaccurate reporting of height and weight could have an impact on diabetes management, including the administration of lower insulin dosage than the person needs for his or her body weight. In research, inaccurate measurements of height and weight among individuals with type 1 diabetes could lead to inaccurate prevalence estimates of obesity or could interfere with the provision of a specialised treatment.

Purpose of the study. To our knowledge, no previous studies examined the height and weight reporting among individuals with type 1 diabetes and disordered eating symptomatology. This study aims to examine the accuracy of self-reports of height and weight among adults with type 1 diabetes and eating disorder symptomatology. The study also aims to investigate whether the differences between self-reports and measurements of height and weight are related to eating disorder pathology, gender, and perfectionism. Using a sample of adults with type 1 diabetes with eating disorder symptomatology and type 1 diabetes control participants, the following research questions were posed:

1. Are there any differences between self-reported and measured height and weight in adults with type 1 diabetes with and without eating disorder symptomatology?
2. What is the extent of these differences in adults with type 1 diabetes with eating disorder symptomatology and control participants, and in males and females?
3. Is there a relationship between eating disorder symptomatology and perfectionism scale scores with the accuracy of self-reports of height and weight in samples of type 1 diabetes with and without eating disorder symptomatology and in males and females?

Method

Sample. The dataset, which was granted from Dr. Rhonda Merwin[19] for secondary data analysis, included data from 83 adults with type 1 diabetes; 65 with some eating disorder pathology and 18 controls. Most participants were females (88%), Caucasian (86.7%), married (63.9%), and college-educated (54.2%). Participants' age ranged from 18 to 68 years old (M = 41.89, SD = 12.43). The dataset included self-reported and measured height and weight as well as other relevant variables. No identifying information for the participants was included.

Participants with missing self-reported or measured height and weight were excluded from the analysis (N = 9). The characteristics of the participants with missing values are presented in Table 4.1 and are similar to the characteristics of the overall sample.

[19] Dr. Rhonda M. Merwin, Duke University Medical Center, Durham, NC.

A non-probability sample of 74 adults (N_{males} = 8, $N_{females}$ = 66) with type 1 diabetes; 57 with eating disorder symptomatology/clinical and 17 controls aged 18 to 68 years ($M_{age\ height}$ = 41.65, $M_{age\ weight}$ = 41.62) had self-reported and measured height and weight.

Table 4. 1. *Variables for participants with missing values (N = 9)*

Variable	Missing height values *M (SD)* or %	Missing weight values *M (SD)* or %
Age	43.89 (14.42)	44.11 (14.23)
Gender	77.8% females	77.8% females
With eating disorder symptomatology	88.9%	88.9%

Participants were invited to participate in a study investigating eating and weight concerns among individuals with type 1 diabetes. They were recruited through patient registries of the Duke University Medical Center and University of North Carolina, online advertisements and flyers placed in nearby clinics. Those who were interested to participate in the study contacted the study coordinator for eligibility screening. Participants had to be 18 to 65 years old and have type 1 diabetes. Exclusion criteria included severe hypoglycemic unawareness, pregnancy, cognitive disabilities that interfered with independent management of diabetes, history of psychosis or mania, and current substance abuse (Merwin et al., 2018; Merwin et al., 2015; Moskovich et al., 2019).

Adults with a score at or above 20 on the Diabetes Eating Problems Survey-Revised (DEPS-R; Markowitz et al., 2010) were screened positive for disordered eating symptomatology. The DEPS-R is a screening tool for disordered eating behaviours in diabetes and includes 16 items, e.g., “I feel fat when I take all of my insulin”, “After I overeat, I skip my next insulin dose”, “Losing weight is an important goal to me.” Higher scores indicate more disordered eating behaviours (Markowitz et al., 2010).

Measures. Participants were asked to self-report their height and weight before actual measurements by answering the following questions: “What is your current weight (in pounds)?” and “What is your current height (in inches)?” All participants knew that they were participating in a research study focused on eating and weight concerns. Researchers did not withhold information that the participants would be measured, but it was also not emphasised per se before the actual measurements. Actual height and weight were measured in the laboratory.

Participants were also asked to complete self-report measures, including the Eating Disorder Examination (EDE), the Eating Inventory (EI), and the Positive and Negative Perfectionism Scale (PANPS). They also completed additional self-report measures not relevant to the present study.

Eating Disorder Examination (EDE). The EDE is a widely-used assessment for eating disorders (Fairburn, Cooper, & O'Connor, 2008). Respondents are asked to answer diagnostic items and items about severity of eating disorder symptoms over the past four weeks (28 days). At the beginning of the interview, respondents are oriented to the time period by recalling events that had happened during the past four weeks, and then they are asked about their eating patterns and how they felt about their shape and weight during this period. Apart from frequency data on behavioural characteristics of eating disorders, the EDE provides subscale scores that reflect the severity of eating disorder symptoms. The subscales of the EDE are Restraint, Eating Concern, Shape Concern, and Weight Concern. The four subscale scores are summed and the sum divided by the number of subscales forming the Global EDE Score. Higher scores indicate greater levels of eating disorder symptomatology. Merwin and colleagues have added diabetes-specific questions to the traditional EDE, not included in the original EDE (see Merwin et al., 2018). The Cronbach's alpha values were .94 for the Global EDE, .88 for the Restraint subscale, .79 for the Eating Concern subscale, .87 for the Shape Concern subscale, and .87 for the Weight Concern subscale.

Eating Inventory (EI). The EI is a 51-item self-report measure designed for several uses including the assessment of eating disorders and obesity (Stunkard & Messick, 1985). It consists of 36 true/false items and 15 forced-choice format questions answered on a four-point scale, with the exception of item 50, which is answered on a six-point scale. It assesses the three dimensions of human eating: a) cognitive restraint, b) disinhibition, and c) hunger. The cognitive restraint score is calculated from 21 items, the disinhibition score from 16 items, and the hunger score from 14 items. High scores indicate high levels of restrained eating, disinhibited eating and predisposition to hunger. For the present study, Cronbach's alpha values were .88 for the EI scale, .78 for the cognitive restraint subscale, .87 for the disinhibition subscale, and .87 for the hunger subscale.

Positive and Negative Perfectionism Scale (PANPS). The PANPS is a 40-item self-report measure of perfectionism (Terry-Short, Owens, Slade, & Dewey, 1995). It was designed to measure positive (e.g., "When I'm competing against others, I'm motivated by wanting to be the best") and negative perfectionism (e.g., "Other people expect nothing less than perfection of me"). Positive perfectionism was defined as the motivation to achieve a goal in order to obtain a positive outcome, and negative perfectionism as the motivation to achieve a goal in order to avoid negative consequences. Terry-Short and colleagues (1995) suggested that negative perfectionism may be a significant characteristic in patients with eating disorders. There are 20 items on the positive subscale and 20 items on the negative subscale. Responses are given on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The scores can range from 20 to 100. Higher scores indicate greater positive and negative perfectionism. The Cronbach's alpha values were .90 for the PANPS scale, .86 for the positive subscale, and .92 for the negative subscale.

Statistical analysis. We calculated the reporting error in height and weight using the following formulas:

$$\text{Reporting error in height}_i = \text{Self-reported height}_i - \text{Measured height}_i \quad (4.1)$$

$$\text{Reporting error in weight}_i = \text{Self-reported weight}_i - \text{Measured weight}_i \quad (4.2)$$

for each individual *i*. Independent samples *t*-tests were performed for group (i.e., type 1 diabetes with eating disorder symptomatology vs. control participants) and gender differences. Cohen's *d* was used to evaluate the differences, with values of 0.2, 0.5, and 0.8 indicating small, medium and large effect sizes respectively (Cohen, 1992). The associations between the reporting error in height and weight and scores on eating disorder symptomatology and perfectionism scales were examined with Pearson's *r* correlation coefficients.

Results

Descriptives. For the overall sample, the mean measured height was 65.98 inches, which was 0.5 inch higher than the mean self-reported height of 65.48 inches. The mean measured weight was 171.56 pounds, which was about 2 pounds higher than the self-reported weight of 169.84 pounds. The mean reporting error in height was -0.49 inches and the mean reporting error in weight was -1.72 pounds. Table 4.2 presents the descriptive statistics for the main variables for the overall sample, by group and gender. In general, all groups underestimated their height, with the exception of controls (excluding outliers), and weight values.

There were some outliers for the reporting error in height and weight. Three cases with reporting error in height | *z*-scores | > 3 were flagged as outliers. All three cases underreported height (by -11.3, -10, -7.8 inches) and were females. Three cases with reporting error in weight | *z*-scores | > 3 were also flagged as outliers. Two of these cases overreported weight (by 10, 9.8 pounds) and the other case underreported weight (by -13.3

pounds). All cases were females. The descriptive statistics for the variables including and excluding the outliers are presented in Table 4.2.

One sample t-tests. One sample *t*-tests (two-tailed) indicated that the reporting error in height was significantly different from zero for the overall sample, $t(73) = -2.06$, $p = .04$, $d = -0.24$; for adults with type 1 diabetes with eating disorder symptomatology, $t(56) = -2.18$, $p = .03$, $d = -0.29$; for adults with type 1 diabetes with eating disorder symptomatology (excluding outliers), $t(54) = -2.17$, $p = .04$, $d = -0.29$; and for females, $t(65) = -2.04$, $p = .05$, $d = -0.25$. One-sample *t*-tests showed that the reporting error in height was not significantly different from zero for controls, $t(16) = -0.62$, $p = .54$, $d = -0.15$; for controls (excluding outliers), $t(15) = 1.04$, $p = .32$, $d = 0.26$; for males, $t(7) = -0.33$, $p = .75$, $d = -0.12$; for females (excluding outliers), $t(62) = -1.11$, $p = .27$, $d = -0.14$; and for the overall sample (excluding outliers), $t(70) = -1.16$, $p = .25$, $d = -0.14$. The *d* values indicated small effect sizes for the difference of the reporting error in height from zero[20].

One sample *t*-tests (two-tailed) indicated that the reporting error in weight was significantly different from zero for the overall sample, $t(73) = -3.87$, $p < .001$, $d = -0.45$; for the overall sample (excluding outliers), $t(70) = -5.16$, $p < .001$, $d = -0.61$; for adults with type 1 diabetes with eating disorder symptomatology, $t(56) = -3.00$, $p = .004$, $d = -0.40$; for adults with eating disorder symptomatology (excluding outliers), $t(53) = -4.47$, $p < .001$, $d = -0.61$; for controls, $t(16) = -2.58$, $p = .02$, $d = -0.63$; for females, $t(65) = -3.85$, $p < .001$, $d = -0.47$; and for females (excluding outliers), $t(62) = -5.30$, $p < .001$, $d = -0.67$. One-sample *t*-tests showed that the reporting error in weight was not significantly different from zero for males, $t(7) = -0.61$ $p = .56$, $d = -0.22$. The *d* values indicated small to medium effect sizes for the difference of the reporting error in weight from zero[21].

Overall, participants on average underreported their height (except the control group excluding outliers), but this was not significantly different from zero for the overall sample and subgroups, with the exception of those with eating disorder symptomatology. With the exception of males, participants on average underreported their weight and this was significantly different from zero for the overall sample and subgroups.

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[20] One-tailed one-sample *t*-tests were also performed to test if the reporting error in height is significantly different from zero, and the results were similar.

[21] One-tailed one-sample *t*-tests were also performed to test if the reporting error in weight is significantly different from zero, and the results were similar.

Table 4. 2. *Descriptive statistics for the main variables, overall sample, by group and gender*

Variable	*N*	Range	Mean (*SD*)	Skewness (*SE*)	Kurtosis (*SE*)
Reporting error in height (inches)					
Overall	74	-11.3 - 2	-0.49 (2.06)	-3.90 (0.28)	16.96 (0.55)
Overall (excl. outliers)	71	-2 - 2	-0.11 (0.77)	0.02 (0.29)	0.83 (0.56)
Clinical group	57	-10 - 1.3	-0.51(1.76)	-4.12 (0.32)	19.27 (0.62)
Clinical group (excl. outliers)	55	-2 - 1.3	-0.21 (0.70)	-0.60 (0.32)	0.63 (0.63)
Controls	17	-11.3 - 2	-0.44 (2.92)	-3.49 (0.55)	13.53 (1.06)
Controls (excl. outliers)	16	-1 - 2	0.23 (0.91)	0.61 (0.56)	-0.55 (1.09)
Males	8	-0.8 - 0.8	-0.06 (0.53)	0.31 (0.75)	-1.24 (1.48)
Females	66	-11.3 - 2	-0.55 (2.17)	-3.69 (0.30)	14.97 (0.58)
Females (excl. outliers)	63	-2 - 2	-0.11 (0.80)	0.02 (0.30)	0.73 (0.60)
Reporting error in weight (pounds)					
Overall	74	-13.3 - 10	-1.72 (3.83)	0.16 (0.28)	2.22 (0.55)
Overall (excl. outliers)	71	-11 - 5.6	-1.89 (3.08)	-0.31 (0.29)	0.73 (0.56)
Clinical group	57	-13.3 - 10	-1.53 (3.86)	0.42 (0.32)	2.45 (0.62)
Clinical group (excl. outliers)	54	-7.5 - 5.6	-1.74 (2.86)	0.17 (0.33)	-0.14 (0.64)
Controls	17	-11 - 4.2	-2.36 (3.77)	-0.92 (0.55)	1.32 (1.06)
Males	8	-6.2 - 3.1	-0.71 (3.31)	-0.43 (0.75)	-0.84 (1.48)
Females	66	-13.3 - 10	-1.85 (3.90)	0.23 (0.30)	2.44 (0.58)
Females (excl. outliers)	63	-11 - 5.6	-2.04 (3.05)	-0.33 (0.30)	1.03 (0.60)

Comparison between the reporting error in weight from the diabetes sample and the Health and Retirement Study (HRS) sample

We now analyse the reporting error in weight from a more representative sample with diabetes; the HRS. We aimed to examine whether individuals with diabetes from the HRS sample report their weight in a similar way with those in the clinical sample. Participants with diabetes from the clinical sample were matched with participants with diabetes from the HRS based on gender and age. Since there was no equal proportion of males in the two samples, it was decided to analyse the data from females only.

In total, 60 females from the HRS and 33 females from the clinical sample were matched on age. Participants' age ranged from 41 to 65 years old. It is important to note that some of those in the clinical sample had diabetes and eating disorder symptomatology, while it is not known whether those in the HRS sample had any symptomatology for eating disorders. One sample *t*-tests (two-tailed) indicated that the reporting error in weight was significantly different from zero for the clinical sample, $t(32) = -3.86$, $p = .001$, $d = -0.67$; but not for the HRS sample, $t(59) = -0.54$, $p = .59$, $d = -0.07$[22]. The reporting error in weight was on average larger (in absolute value) for the clinical sample ($M = -1.60$, $SD = 2.38$) than the HRS sample ($M = -1.08$, $SD = 15.46$). An independent samples *t*-test indicated that the difference between the two samples was not significant, $t(63.97) = 0.25$, $p = .80$, $d = 0.05$[23].

There were some outliers for the reporting errors in weight in the HRS sample. Four cases with reporting error in weight | *z*-scores | > 3 were flagged as outliers. Two of these cases overestimated weight (by 49, 79 pounds), and the other two underestimated weight (by -36, -33 pounds). One sample *t*-test (two-tailed) indicated that the reporting error in weight was significantly different from zero for the HRS sample, $t(55) = -2.30$, $p = .03$, $d = -0.31$[24]. While the reporting error in weight was on average larger (smaller in number, but larger deviation from zero) for the HRS sample ($M = -2.21$, $SD = 7.22$) than the clinical sample ($M = -1.60$, $SD = 2.38$), an independent *t*-test indicated that the difference between the two samples was not significant, $t(72.88) = -0.59$, $p = .56$, $d = 0.11$[25].

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[22] The results were similar when one-tailed one-sample *t*-tests were performed.

[23] A Mann-Whitney Test also indicated that this difference was not significant, $U = 966$, $Z = -.19$, $p = .85$.

[24] The results were similar when one-tailed one-sample *t*-test was performed.

[25] A Mann-Whitney Test also indicated that this difference was not significant, $U = 900$, $Z = -.20$, $p = .84$.

In addition, an individual matching on age was performed for the two samples (N_{HRS} = 20, $N_{clinical}$ = 20). Participants were matched on age ± 1 year. While a paired *t*-test showed that the reporting error in weight was on average larger (in absolute value) for the clinical sample (*M* = -2.11, *SD* = 1.81) than the HRS sample (*M* = -1.10, *SD* = 5.50), the difference between the two samples was not significant, $t(19) = 0.85$, $p = .41$.

Overall, the analysis indicated that individuals with diabetes from a more representative sample, the HRS, tend to underestimate their weight in a similar way to those from a more selected sample, the clinical sample. The difference in underestimation was not significant, even though the data were collected in different contexts, i.e., in households for the HRS sample, and in the laboratory for the clinical sample, and some of those in the clinical sample had diabetes and eating disorder symptomatology while it is not known whether those in the HRS sample had any; the results indicate that in general females with diabetes tend to underestimate their weight.

Reporting error and group differences. First, we compared the two groups of adults with (*N* = 57, 93% female) and without (*N* = 17, 76.5% female) eating disorder symptomatology to establish if there were differences in terms of age, BMI, EDE Global, EI scale, and PANPS scale. As shown in Table 4.3, the adults of the two groups did not differ in terms of age, BMI, and positive perfectionism. The two groups were not equal in terms of eating disorder symptomatology and negative perfectionism; a significant characteristic in people with eating disorders (Terry-Short et al., 1995). Adults in the eating disorder symptomatology group had on average higher scores on eating disorder symptomatology scales (except the Restraint subscale) and on negative perfectionism scale compared to the control group.

Table 4. 3. *Comparison of adults with eating disorder symptomatology and controls*

Variables	Clinical *M (SD)*	Controls *M (SD)*	*t*	*d*
Age	41.74 (12.57)	41.24 (11.57)	0.15	0.04
BMI	28.48 (6.37)	25.26 (5.20)	1.90	0.55
EDE Global	2.18 (1.11)	0.80 (0.60)	6.65^{*}	1.55
EI Restraint	10.18 (4.37)	9.24 (3.19)	0.82	0.25
EI Disinhibition	9.39 (4.30)	3 (2.26)	8.08^{*}	1.86
EI Hunger	6.53 (3.91)	2.59 (2.87)	4.53^{*}	1.15
Positive Perfectionism	75.29 (9.73)	76.24 (9.59)	-0.35	0.10
Negative Perfectionism	60.44 (14.95)	48.65 (10.63)	3.03^{**}	0.91

Note. * $p < .001$, ** $p < .05$

The difference between adults with type 1 diabetes with eating disorder symptomatology and controls on the reporting error in height was not significant, $t(72) = -0.12$, $p = .91$, $d = 0.03$[26]. After excluding the outliers, the reporting error in height was on average larger for controls ($M = 0.23$, $SD = .91$) than for adults with eating disorder symptomatology ($M = -0.21$, $SD = .70$), $t(69) = -2.06$, $p = .04$, $d = 0.54$, indicating a medium effect size[27].

An independent *t*-test indicated that the difference between those with eating disorder symptomatology and controls on the reporting error in weight was not significant, $t(72) = 0.78$, $p = .44$, $d = 0.22$[28]. After excluding the outliers, the difference was still not significant, $t(69) = 0.72$, $p = .47$, $d = 0.19$.[29]

Overall, no significant group differences were found on mean reporting error in height and weight between adults with type 1 diabetes with disordered eating symptomatology and control participants. We only found a significant difference between the clinical and control groups on the height reporting after excluding outliers; however this difference was no longer significant when a more robust, non-parametric test was performed.

[26] A Mann-Whitney Test also indicated that this difference was not significant, $U = 402$, $Z = -1.07$, $p = .29$.

[27] A Mann-Whitney Test indicated that this difference was not significant, $U = 345$, $Z = -1.32$, $p = .19$.

[28] A Mann-Whitney Test also indicated that this difference was not significant, $U = 462.50$, $Z = -.28$, $p = .78$.

[29] A Mann-Whitney Test also indicated that this difference was not significant, $U = 445.50$, $Z = -.18$, $p = .86$.

Reporting error and gender differences. There was a non-significant difference between males and females on the reporting error in height, $t(72) = 0.62$, $p = .54$, $d = 0.30$[30]. Similarly after excluding the outliers, the difference was not significant, $t(69) = 0.17$, $p = .87$, $d = 0.07$[31].

There was also a non-significant difference between males and females on the reporting error in weight, $t(72) = 0.79$, $p = .43$, $d = 0.31$[32]. After excluding outliers, the difference was not significant, $t(69) = 1.15$, $p = .26$, $d = 0.42$[33].

Overall, no significant differences were found on mean reporting error in height and weight between males and females.

Reporting error and eating disorder symptomatology. As presented in Table 4.4, no significant correlations were found between the reporting error in height and the scores on the EDE Restraint, EDE Eating Concern, EDE Shape Concern, EDE Weight Concern, EDE Global score, EI Restraint, EI Disinhibition and EI Hunger for all samples.

Table 4.5 presents correlations between the reporting error in weight and eating disorder symptomatology scales. For the overall and clinical samples, there were no significant correlations between the reporting error in weight and eating disorder symptomatology scales.

For controls, there was only a significant positive correlation between the reporting error in weight and scores on the EI Disinhibition, $r = .54$, $p = .03$. As shown in Figure 4.1 (a), controls with lower scores on the disinhibition subscale tend to underestimate their weight more compared to those with higher scores. It is important to note that the sample size of the control group is small, and one case with high disinhibition score appears as influential on the correlation coefficient estimate. Spearman's *rho* coefficient was also performed and the result was not significant, $rho = .26$, $p = .31$. We compared the correlations between reporting error in weight and EI Disinhibition to investigate whether the correlations were significantly different for the clinical and control groups, and a non-significant difference was found, $z = -1.55$, $p = .06$.

For males, there were significant negative correlations between the reporting error in weight and scores on the EDE Shape Concern, $r = -.89$, $p = .003$; EDE Weight Concern,

[30] A Mann-Whitney Test also indicated that this difference was not significant, $U = 244$, $Z = -.35$, $p = .73$.

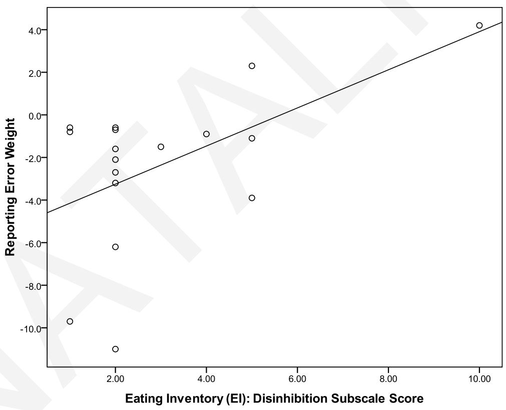
[31] A Mann-Whitney Test also indicated that this difference was not significant, $U = 244$, $Z = -.15$, $p = .88$.

[32] A Mann-Whitney Test also indicated that this difference was not significant, $U = 207.50$, $Z = -.98$, $p = .33$.

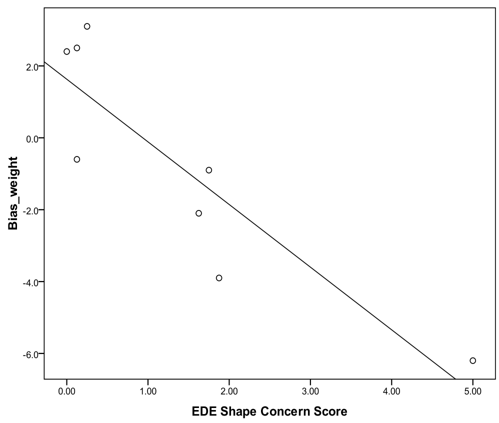
[33] A Mann-Whitney Test also indicated that this difference was not significant, $U = 191.50$, $Z = -1.10$, $p = .27$.

r = -.73, p = .04; EDE Global, r = -.77, p = .03; and EI Restraint, r = -.77, p = .02. Male participants with higher scores on the three EDE and EI Restraint subscales tend to underestimate their weight more than males with lower scores on the subscales. Again, due to the small sample size of males, these correlations should be interpreted with caution. We also compared the correlations between the reporting error in weight and EDE Shape Concern, EDE Weight Concern, EDE Global and EI Restraint to examine whether the correlations were significantly different for males and females. We found significant differences for the correlations between the reporting error in weight and EDE Shape Concern, z = -3.54, p < .001, EDE Weight Concern, z = -2.41, p = .008, EDE Global, z = -2.54, p = .005, and EI Restraint, z = -2.52, p = .006 in males and females. Nevertheless, due to the small sample size of males, it should be further investigated for gender differences in relation to eating disorder symptomatology and reporting error in weight, and why diabetic males present negative correlations, while females are not.

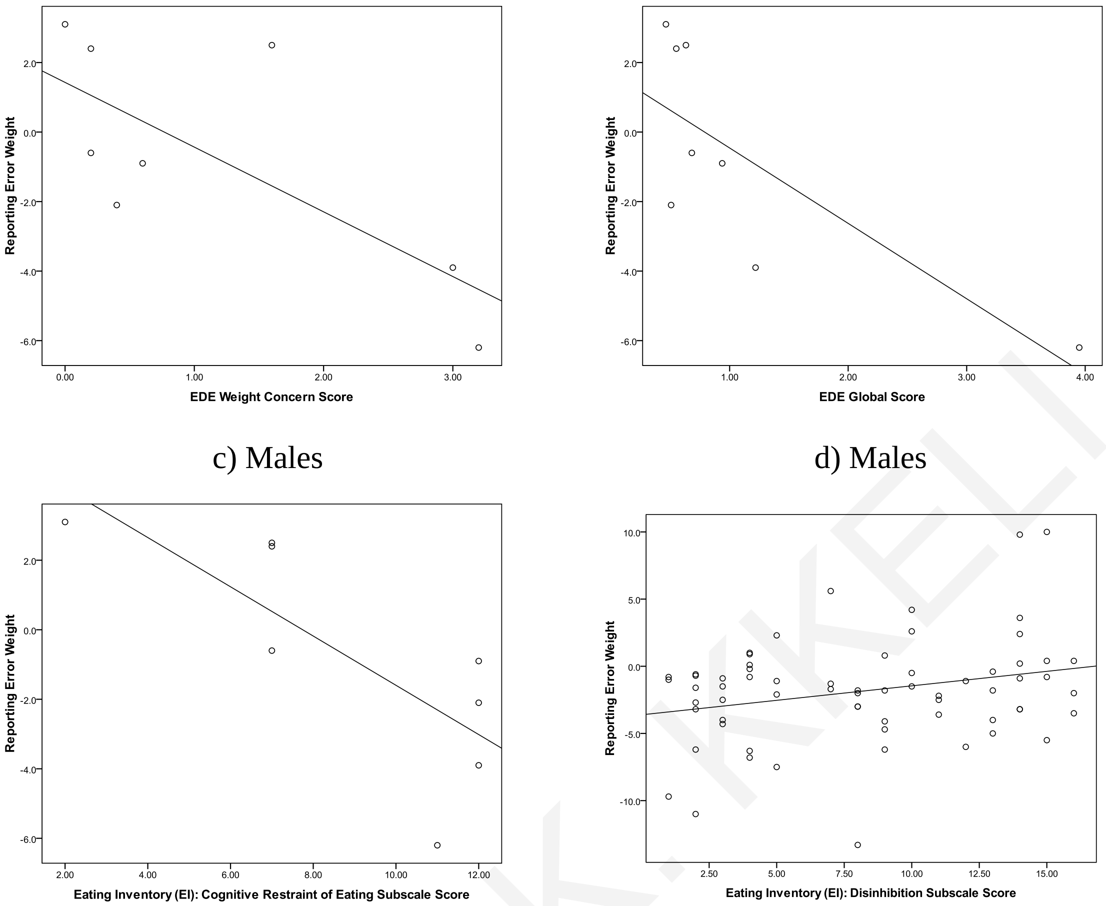
For females, there was only a significant positive correlation between the reporting error in weight and scores on the EI Disinhibition, r = .27, p = .03. Females with lower scores on the disinhibition subscale tend to underestimate their weight more than females with higher scores. We compared the correlations between reporting error in weight and EI Disinhibition to investigate whether the correlations were significantly different for males and females, and a non-significant difference was found, z = -1.36, p = .09.



a) Controls



b) Males



c) Males d) Males

e) Males f) Females

Figure 4. 1. Scatterplots of the reporting error in weight and eating disorder symptomatology scores.

Table 4. 4. *Correlations of the reporting error in height with eating disorder symptomatology scale scores*

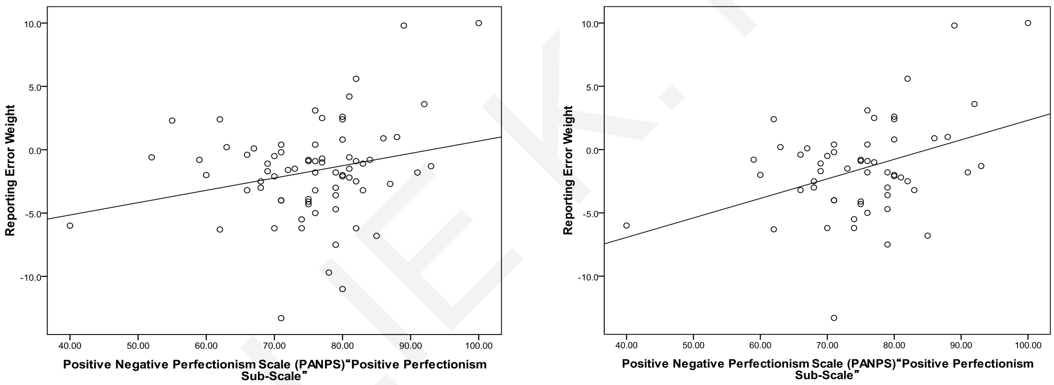
	Sample								
Measure	Overall	Overall (excl. outliers)	Clinical	Clinical (excl. outliers)	Controls	Controls (excl. outliers)	Males	Females	Females (excl. outliers)
EDE Restraint	-.11	-.11	-.21	.01	.19	-.12	.49	-.11	-.15
EDE Eating Concern	.05	.03	.09	.18	-.01	-.22	.50	.05	-.01
EDE Shape Concern	.11	-.03	.11	.07	.20	.03	.64	.13	-.08
EDE Weight Concern	.07	-.07	.07	.08	.16	-.12	.25	.10	-.09
EDE Global	.04	-.06	.02	.10	.23	-.11	.57	.05	-.11
EI Restraint	.03	-.02	.02	-.01	.10	.02	.57	.03	-.06
EI Disinhibition	-.11	-.17	-.19	-.01	.04	-.24	.41	-.11	-.21
EI Hunger	.003	-.21	-.03	-.07	.12	-.35	-.04	.02	-.23

Table 4. 5. *Correlations of the reporting error in weight with eating disorder symptomatology scale scores*

	Sample							
Measure	Overall	Overall (excl. outliers)	Clinical	Clinical (excl. outliers)	Controls	Males	Females	Females (excl. outliers)
EDE Restraint	.01	-.13	-.05	-.26	.11	-.32	.05	-.09
EDE Eating Concern	-.05	.01	-.11	-.04	.12	-.59	.01	.11
EDE Shape Concern	.09	-.05	.02	-.19	.27	$-.89^{*a}$	$.22^{b}$	.11
EDE Weight Concern	.09	-.09	.11	-.12	-.21	$-.73^{*c}$	$.19^{d}$	.02
EDE Global	.05	-.08	-.004	-.20	.09	$-.77^{*e}$	$.16^{f}$	.04
EI Restraint	.07	-.01	.02	-.11	.26	$-.77^{*g}$	$.15^{h}$	.08
EI Disinhibition	.20	.11	.14	-.01	$.54^{*}$	-.34	$.27^{*}$	.19
EI Hunger	.15	.09	.11	.03	.20	-.15	.20	.15

Note. * $p < .05$; the different superscripts indicate a significant difference in *z*-test for the comparison of two correlation coefficients.

Reporting error and perfectionism. As shown in Table 4.6, there were no significant correlations between the reporting error in height and scores on perfectionism scale for all samples. Table 4.6 also presents correlations of the reporting error in weight with scores on the perfectionism scale. For the overall sample, there was a significant positive correlation between the reporting error in weight and scores on the positive perfectionism subscale, $r = .24$, $p = .04$. This seemed to be driven by the clinical sample, where there was a significant positive correlation between the reporting error in weight and scores on the positive perfectionism subscale, $r = .39$, $p = .003$. Participants with higher scores on the positive perfectionism scale tended to underestimate their weight less than those with lower scores (see Figure 4.2). We also compared the correlations between reporting error in weight and perfectionism scale to examine whether the correlations were significantly different for clinical and control groups. We found a significant difference for the correlations between reporting error in weight and perfectionism, $z = 2.23$, $p = .01$.



a) Overall

b) Clinical

Figure 4. 2. Scatterplots of the reporting error in weight and positive perfectionism.

Table 4. 6. *Correlations of the reporting error in height and weight with the perfectionism scale*

Measure	Sample								
	Overall	Overall (excl. outliers)	Clinical	Clinical (excl. outliers)	Controls	Controls (excl. outliers)	Males	Females	Females (excl. outliers)
Reporting error in height									
Positive Perfectionism	-.08	-.16	.02	-.11	-.24	-.31	-.50	-.07	-.15
Negative Perfectionism	.02	-.21	.002	-.11	.12	-.28	.01	.03	-.22
Reporting error in weight									
Positive Perfectionism	.24*	.08	.39*a	.22	-.25b	-	.56	.23	.04
Negative Perfectionism	.14	.02	.09	-.08	.23	-	-.12	.16	.04

Note. * $p < .05$; the different superscripts indicate a significant difference in *z*-test for the comparison of two correlation coefficients.

Discussion

The present study aimed to examine the differences between self-reports and actual measurements of height and weight and investigate the role of eating disorder symptomatology, gender and perfectionism in relation to the accuracy of self-reports among adults with type 1 diabetes with eating disorder symptomatology and type 1 diabetes control participants. To the best of our knowledge, this is the first study that examined height and weight reporting in individuals with type 1 diabetes with disordered eating symptomatology.

First, the findings of the study suggest that there were differences between self-reports and measurements of height and weight. On average, participants underestimated both their height and weight. However, the mean reporting error for height was only significantly different from zero for the clinical sample; with the inclusion of a few outliers, the difference was significant for the overall and female samples as well. The underestimation of height was quite unexpected, as it comes in contrast with the tendency for overestimation of height in most previous studies, as well as our results in the larger community sample (see Study 1). Possible reasons for this unexpected underestimation of height may be that people remember their height from earlier years, or that they are not concerned with the need to be present themselves as tall. On the other hand, the mean reporting errors in weight were significantly different from zero for all samples, apart from males perhaps due to the small sample size. The underestimation of weight is consistent with past studies that examined the presence of diabetes and weight reporting (Jeffery, 1996; Yiannakoulia et al., 2006). This underestimation of weight is also evident in diabetes samples, just like in community samples (see Studies 1 and 2 of this dissertation).

Second, our results suggest no significant group or gender differences on mean reporting error in height. Given the absence of literature on the reporting error in height in individuals with type 1 diabetes with eating disorder symptomatology, no hypotheses could be formed based on previous findings. Nevertheless, we expected no group differences on height reporting since both individuals with type 1 diabetes with and without eating disorder symptomatology may give more emphasis on their weight rather than their height, as their weight and type 1 diabetes are highly interconnected. In regards to gender differences, some previous studies on general population that reported height underestimation, found that females underestimated their height more than males (-1.7 cm vs. -1.3 cm; -0.9 cm vs. -0.7 cm) (Bolton-Smith et al., 2000; Hensley, 1998). However, the presence of type 1 diagnosis in our sample may eliminate any significant differences between males and females. Alternatively, the inability to detect any differences between the samples could be due to the small sample size.

Third, the findings of our study also suggest that adults with type 1 diabetes with eating disorder symptomatology and controls tend to underestimate their weight. These results appear to be strengthened by an additional analysis that examined the reporting error in weight in individuals with diabetes from a more representative HRS sample, where we found that they tend to underestimate their weight similarly to the clinical sample.

We also found a non-significant difference in regards to weight underestimation in adults with type 1 diabetes with eating disorder pathology and controls. Based on their BMIs, adults of both groups were categorised as overweight. Possibly they both underestimated their weight due to the fact that they were more dissatisfied with their bodies and weight (Goldfield et al., 2010). Previous studies indicate underestimation of weight in people with diabetes (Yiannakoulia et al., 2006). However, no past studies examined weight reporting in individuals with type 1 diabetes with eating disorder symptomatology. Studies that examined reporting error and eating disorder symptomatology supported that individuals with disordered eating tend to overestimate their weight in order to hide their unhealthy weight behaviours or due to the distorted body image they have about themselves (Ambwani & Chmielewski, 2013; Conley & Boardman, 2007; Heilbrun & Friedberg, 1990). However, the presence of diabetes and eating disorder symptomatology in combination with BMI may play a different role in weight reporting. Individuals with type 1 diabetes and eating disorder symptomatology tend to restrict or omit their insulin treatment in order to lose weight (Merwin et al., 2014). The dissatisfaction they may have about their bodies and their desire to lose body weight may lead them to underestimate their weight. Alternatively, they may underestimate their weight in order to receive a restricted amount of insulin treatment; since the insulin dosage is related to individual's weight, and as a result to lose some weight.

Our findings are consistent with previous studies suggesting underestimation of weight in both males and females with diabetes (Yiannakoulia et al., 2006). However, the underestimation of weight was on average larger, but non-significantly so, in females than in males. In general, females exhibit a higher degree of underestimation of weight compared to males due to the greater emphasis they give on thinness and the pressure they may perceive to achieve an ideal body (Polivy et al., 2014). It is likely that the small sample size of males did not allow detection of significant gender differences.

There was some evidence that the scores on eating disorder symptomatology and perfectionism scales are related to the accuracy of weight reporting. It was found that males who exhibited higher concerns about their weight and shape and attempted to consciously monitor and regulate their food intake, tended to underestimate their weight more compared to those who were less concerned about these. It is reasonable that individuals who are dissatisfied with their weight and body shape and attempt to lose weight to underestimate their weight values. However, these results should be interpreted with caution due to the small sample size of males. It was also found that control participants and females with lower scores on the disinhibition subscale tended to underestimate their weight more compared to those with higher scores. These individuals who exhibit a small tendency to overeat in response to different stimuli, may have eating and weight related concerns and they possibly underestimate their weight more than those with higher scores on this subscale. Lastly, it was found that the overall and clinical samples with higher scores on the positive perfectionism subscale tended to underestimate their weight less than those with lower scores. It could be that individuals with positive perfectionism are more conscientious, and possibly this is the reason that they underestimate their weight less compared to others.

One main limitation of the current study is the small sample size that did not allow us to detect any significant group and gender differences. The generalisation of the results of the study may be limited by the fact that the sample was self-selected due to interest in eating and weight concerns in type 1 diabetes and were mostly well-educated females with type 1 diabetes (Merwin et al., 2018). Future studies should recruit a more representative sample to examine misreporting of height and weight in adults with type 1 diabetes with and without eating disorder symptomatology, and also match the two samples where possible in terms of some characteristics. In addition, measurements of height and weight were not emphasised per se, but the general description of the study may lead participants to suspect that they will be measured, and therefore this information may have had an impact on the accuracy of their self-reports.

Overall, the present study examined the accuracy of self-reports of height and weight in adults with type 1 diabetes with eating disorder symptomatology and type 1 diabetes control participants. Our results suggest that this clinical population is not very accurate in self-reporting their height and weight. Both adults with type 1 diabetes with or without eating disorder symptomatology, and males and females, tend to underestimate their weight, with medium effect sizes. Although, compared to the general population samples (see Studies 1 and 2 of this dissertation), this population appears to report their weight more accurately, and especially those with type 1 diabetes with eating disorder symptomatology. Even though these individuals on average may be dissatisfied with their bodies and/or have the desire to lose weight, their concern with their weight due to diabetes may make them more aware about their body weight. Reporting error in height was less pronounced.

Since such measures are important in monitoring health status, and in light of the inaccuracy in self-reports, actual measurements should be taken whenever possible. Clinicians and researchers should consider these inaccuracies when they ask from their patients or participants to report their height and weight. Otherwise the consideration of self-reported values could possibly lead to undesirable clinical practices and inaccurate findings.

Chapter 5

Study 4: The differences between self-reports and measurements of height and weight among females who have been weight-restored from anorexia nervosa

Introduction

Eating disorders are associated with disturbances of eating behaviours and preoccupation with food, eating and body image that impair physical health and psychosocial functioning (American Psychological Association [APA], 2013). Different types of eating disorders emerge, including anorexia nervosa. Anorexia nervosa is characterised by restriction of energy intake leading to a significantly low body weight, intense fear of weight gain or persistent behaviour that interferes with weight gain, excessive influence of body weight or shape on self-evaluation, as well as an inability to recognise the seriousness of the current low weight (APA, 2013). The prevalence of anorexia nervosa is around 0.9% among females, and 0.3% among males (Hudson, Hiripi, Pope, & Kessler, 2007) and is associated with high mortality rate (Birmingham, Su, Hlynsky, Goldner, & Gao, 2005).

Many factors have been involved in the development and maintenance of anorexia nervosa, including low self-esteem, interpersonal difficulties and emotion disregulation (Fairburn, Cooper, & Shafran, 2003). Perfectionism, which is characterised by the setting of high standards that a person attempts to achieve and evaluates himself or herself based on these, has been also suggested to be a risk and maintaining factor for anorexia nervosa (Lloyd, Yiend, Schmidt, & Tchanturia, 2014; Schmidt & Treasure, 2006). It has been found that individuals recovered from anorexia nervosa continue to exhibit perfectionism (Bastiani, Rao, Weltzin, & Kaye, 1995).

Weight restoration is a core aspect in the treatment interventions of anorexia nervosa (Kezelman, Touyz, Hunt, & Rhodes, 2015). According to the APA guidelines (2006), the aim is to rehabilitate patients with anorexia nervosa to a healthy weight adapted to the needs of each patient. Both the APA (2006) and National Institute for Health and Care Excellence (NICE; 2004) guidelines for anorexia nervosa suggest on average weekly weight gain of 0.5 - 1 kg for hospitalised patients and 0.5 kg for those in outpatient settings. Weight restoration is crucial to prevent serious physical complications and should be coupled with psychotherapy to help patients improve attitudes toward weight and food and change cognitive distortions about thinness, weight, shape, food and exercise (Bachner-Melman, Zohar, & Ebstein, 2006).

Research on eating disorders often relies on self-reports of height and weight for practical reasons. The literature provides evidence on the ability of individuals with eating disorders to accurately self-report their height and weight values. Barnes and colleagues (2010) examined obese patients with binge-eating disorder and found that they were reasonably accurate reporters of their height and weight; they underestimated their weight by an average of 0.6 pounds and overestimated their height by an average of 0.3 inches. In overweight adults with binge eating disorder, White, Masheb and Grilo (2010) found that they were reasonably accurate reporters; they underestimated their weight by an average of 1kg and overestimated their height by an average of 0.1 cm. In a study by McCabe and colleagues (2001), patients with anorexia nervosa slightly overestimated their weight by a mean of 0.32 kg, and patients with bulimia nervosa slightly underestimated it by a mean of 0.61 kg. Both groups overestimated their height; by an average of 0.90 cm for patients with anorexia nervosa and 1.12 cm for those with bulimia nervosa. Meyer, Arcelus and Wright (2009) examined female patients with eating disorders and found that those with anorexia nervosa overestimated their weight while those with bulimia nervosa underestimated it. Both diagnostic groups were accurate reporters of their height. Lastly, Doll and Fairburn (1998) examined females with bulimia nervosa and found no significant difference between self-reported and measured height and a slight underestimation of weight by 0.3 kg on average. In general, individuals with eating disorders appear to be quite accurate reporters of their height and weight; any discrepancies of the degree of misreporting among the previous studies could be attributed to different samples, diagnostic groups and methodologies.

Among healthy adults of the general population, there is a tendency to overestimate height and underestimate weight, resulting in a lower Body Mass Index (BMI) estimation than the actual BMI. Previous studies indicate that the mean error of self-reported height varied from 0.5 cm to 7.5 cm, and the mean error of self-reported weight from -0.1 kg to -3.5 kg (see Gorber et al., 2007 for a systematic review). Inaccuracies in self-reports of height and weight seem to be larger in healthy samples compared to samples with eating disorders.

Although the validity of self-reports of height and weight has been extensively studied among adults with eating disorders and healthy individuals, there is limited knowledge about reporting in adults who have been weight-recovered from anorexia nervosa. To our knowledge, only one previous study has been conducted to investigate the accuracy of self-reports of height and weight in individuals who have been weight-recovered from anorexia nervosa. Wolfe and colleagues (2013) found that females who have been weight-recovered from anorexia nervosa underestimated their weight (by 1.4 kg) and overestimated their height (by 1.4 cm) similar to the healthy control group (by 1.5 kg, 0.7 cm), whereas females with anorexia nervosa were accurate reporters of their height (overestimate by 0.4 cm) and weight (underestimate by 0.2 kg) values. The authors stated that females who have been weight-restored from anorexia nervosa did not differ in their reporting from control group as they may both have similar levels of body dissatisfaction and eating behaviours. It is important to note that Wolfe and colleagues (2013) collected self-reports and actual measurements of height and weight with time difference. Self-reports and actual measurements were not collected on the same day, as self-reports were obtained during telephone interview, while measurements of height and weight during an initial outpatient screening visit.

Purpose of the study. This study aims to investigate the accuracy of self-reports of height and weight among females who have been weight-restored from anorexia nervosa relative to healthy controls. The study also aimed to examine whether the reporting errors in height and weight are related to eating disorder symptomatology and perfectionism. The research questions and hypotheses of the present study are as follows:

1. Are there any differences between self-reports and measurements of height and weight in female samples who have been weight-restored from anorexia nervosa and healthy controls?
    - It is hypothesised that both groups will underestimate their weight and overestimate their height.
2. What is the extent of these differences in females who have been weight-restored from anorexia nervosa and those with no history of an eating disorder?
    - It is hypothesised that females who have been weight-restored from anorexia nervosa will underestimate their weight and overestimate their height in a similar way to healthy controls.
3. Is there a relationship between eating disorder symptomatology and perfectionism scale scores with the accuracy of self-reports in samples of females who have been weight-recovered from anorexia nervosa and controls?

Method

Sample. The data, which were granted from Dr. Rhonda Merwin[34] for secondary data analysis, included information from 75 adults; 37 adults who have been weight-restored from anorexia nervosa and 38 adults with no history of an eating disorder. Participants aged 18 to 36 years old (*M* = 22.79, *SD* = 3.94). Most of them were females (97.3%). Anorexia nervosa is more prevalent among females than males (Hudson et al., 2007). Since the dataset included information from two males - one in each group, any comparisons between males and females would be unreliable; thus male participants were excluded from the analysis. The dataset included self-report measures and self-reports and actual measurements of height and weight. It was anonymous and no identifying information was included.

After the exclusion of males, the dataset included information from 73 females; 36 who have been weight-restored from anorexia nervosa and 37 healthy controls. One female participant with a reporting mistake, i.e., measured height has been entered as 34.50 inches, while the self-reported height was 64.50 inches, was excluded from the dataset. The final dataset included data from 72 females; 35 who have been weight-restored from anorexia nervosa and 37 healthy controls. Females aged 18 to 36 years old (*M* = 22.96, *SD* = 3.92). Their mean BMI was 22.03 kg/m^2 (*SD* = 3.06).

Procedure. Participants were invited to participate in a study investigating how individuals with eating disorders process information. Participants were recruited from the Duke University, Duke University Medical Center and the general community via flyers and online advertisements. Individuals who expressed their interest to participate in the study completed an initial telephone screening. The interview included a semi-structured interview examining anorexia nervosa, weight recovery and eligibility criteria. Those who met initial screening criteria were asked to complete an assessment of current and lifetime eating disorder symptoms either via phone or online, in order that researchers could identify any ineligible individuals (Merwin et al., 2013; Moskovich, 2014).

Participants were classified into two groups; those who have been weight-recovered from anorexia nervosa and those with no history of an eating disorder. To be eligible, participants in the anorexia group had to have a previous diagnosis of anorexia nervosa based on the criteria of the Diagnostic and Statistical Manual of Mental Disorders V (DSM-IV; APA, 1994) and been weight-recovered for at least six months. Individuals who have been weight-recovered had to have a BMI equal or greater than 18.5. If

[34] Dr. Rhonda M. Merwin, Duke University Medical Center, Durham, NC.

individuals had a BMI below 18.5 but maintained their weight without attempting to restrict calories or exhibiting unhealthy weight loss behaviours and had a regular menstrual cycle, met eligibility for the weight restoration group. Individuals in the control group had to have no history of anorexia nervosa or any other eating disorder (Moskovich, 2014). Individuals who had a diagnosis of bipolar disorder, schizophrenia, learning disability, or substance abuse were excluded from the study. Those who were taking psychotropic medication on a steady dosage for a minimum of two months were not excluded from the study (Moskovich, 2014).

Measures. Participants were asked to self-report their height and weight by answering the following questions: “What is your height (in inches) at present? Please give your best estimate” and “What is your weight (in pounds) at present? Please give your best estimate.” Actual height and weight measurements were then taken in the laboratory. Researchers did not withhold information that the individuals would be measured, but it was also not emphasised per se.

Participants were also asked to complete self-report measures, including the Eating Disorder Examination Questionnaire (EDE-Q) and the Positive and Negative Perfectionism Scale (PANPS). They also completed additional measures not relevant to the present study.

Eating Disorder Examination Questionnaire (EDE-Q). The EDE-Q is a 28-item self-report measure of eating disorder symptomatology over the past 28 days (Fairburn & Beglin, 1994). The items of the measure form four subscales: Restraint, Eating Concern, Shape Concern, and Weight Concern. A global score is calculated from the mean of the four subscales. Items are rated on a 7-point scale, ranging from 0 to 6. Higher scores indicate greater levels of eating disorder symptomatology. Items 13 to 18 assess the frequency of particular eating behaviours over the past 28 days and are not included in the subscale scores. The Cronbach’s alpha values were .94 for the Global EDE-Q, .77 for the Restraint subscale, .74 for the Eating Concern subscale, .91 for the Shape Concern subscale, and .86 for the Weight Concern subscale.

Positive and Negative Perfectionism Scale (PANPS). The PANPS is a 40-item self-report measure of perfectionism (Terry-Short, Owens, Slade, & Dewey, 1995). It was designed to measure positive (e.g., “When I’m competing against others, I’m motivated by wanting to be the best”) and negative perfectionism (e.g., “Other people expect nothing less than perfection of me”). Positive perfectionism was defined as the motivation to achieve a goal in order to obtain a positive outcome, and negative perfectionism as the motivation to achieve a goal in order to avoid negative consequences (Terry-Short et al., 1995). Terry-Short and colleagues (1995) suggested that negative perfectionism may be a significant characteristic in patients with eating disorders. There are 20 items on the positive subscale and 20 items on the negative subscale. Responses are given on a five-point scale ranging from strongly disagree (1) to strongly agree (5). The scores can range from 20 to 100. Higher scores indicate greater positive and negative perfectionism. The Cronbach's alpha values were .92 for the PANPS, .88 for the Positive Perfectionism subscale, and .92 for the Negative Perfectionism subscale.

Statistical analysis. We calculated the reporting errors for height and weight using the following formulas:

$$\text{Reporting error in height}_i = \text{Self-reported height}_i - \text{Measured height}_i \quad (5.1)$$

$$\text{Reporting Error in weight}_i = \text{Self-reported weight}_i - \text{Measured weight}_i \quad (5.2)$$

for each individual *i*. Independent samples *t*-tests were performed for group differences. Cohen's *d* was used to evaluate the differences, with values of 0.2, 0.5, and 0.8 indicating small, medium and large effect sizes respectively (Cohen, 1992). The associations between the reporting error in height and weight and scores on eating disorder symptomatology and perfectionism scales were examined with Pearson's *r* correlation coefficients.

Results

Descriptives. Table 5.1 presents the descriptive statistics for the variables that were used in the analysis. For the overall sample, the mean measured height was 65.27 inches, which was slightly lower than the mean self-reported height of 65.39 inches. The mean measured weight was 133.74 pounds, which was higher than the mean self-reported weight of 132.91 pounds. The mean reporting error in height was 0.12 inches and the mean reporting error in weight was -0.82 pounds. The mean reporting error in height and weight is also presented in Table 5.1 for the clinical and healthy control groups separately. In general, height was overestimated, with the exception of the clinical group (excluding outliers), and weight was underestimated.

There were some outliers for the reporting error in height and weight. Two cases with reporting error in height and weight $|z\text{-scores}| > 3$ were flagged as outliers. One case in the clinical group overestimated height (by 2.96 inches) and the other in the control group overestimated weight (by 14 pounds) respectively. The descriptive statistics for the main variables including and excluding the outliers are presented in Table 5.1.

One-sample t-tests. One-sample *t*-tests (two-tailed) showed that the reporting error in height was not significantly different from zero for the overall sample, $t(71) = 1.71$, $p = .09$, $d = 0.20$; for the overall sample (excluding outliers), $t(70) = 1.37$, $p = .17$, $d = 0.16$; for the clinical group, $t(34) = 0.46$, $p = .65$, $d = 0.08$; and for the clinical group (excluding outliers), *t*(33) = - 0.37, *p* = .71, *d* = -0.06. It was significantly different from zero only for the healthy control group, *t*(36) = 2.50, *p* = .02, *d* = 0.41[35].

One-sample *t*-tests (two-tailed) showed that the reporting error in weight was not significantly different from zero in any of the samples examined: for the overall sample, *t*(71) = -1.43, *p* = .16, *d* = -0.17; for the overall sample (excluding outliers), *t*(70) = -1.89, *p* = .06, *d* = -0.22; for the healthy control group, *t*(36) = -0.85, *p* = .40, *d* = -0.14; for the healthy control group (excluding outliers), *t*(35) = -1.57, *p* = .13, *d* = -0.26; and for the clinical group, *t*(34) = -1.14, *p* = .26, *d* = -0.19[36].

Participants on average overestimated their height, except of those in the clinical group (excluding outliers), but this was not significantly different from zero for the overall and clinical samples; it was significantly different from zero for the healthy group only. They underestimated their weight on average, but this was not significantly different from zero for all groups.

Table 5. 1. *Descriptive statistics for the main variables for the overall sample and by group*

Variable	*N*	Range	Mean (*SD*)	Skewness (*SE*)	Kurtosis (*SE*)
Reporting error in height (inches)					
Overall	72	-1 - 2.96	0.12 (0.57)	1.72 (0.28)	7.51 (0.56)
Overall (excl. outliers)	71	-1 - 1	0.08 (0.47)	0.18 (0.29)	0.18 (0.56)
Clinical group	35	-1 - 2.96	0.05 (0.70)	2.11 (0.40)	7.96 (0.78)
Clinical group (excl. outliers)	34	-1 - 1	-0.03 (0.49)	0.18 (0.40)	0.10 (0.79)
Controls	37	-0.75 - 1	0.17 (0.42)	0.49 (0.39)	0.20 (0.76)
Reporting error in weight (pounds)					
Overall	72	-14.80 - 14	-0.82 (4.90)	-0.09 (0.28)	2.22 (0.56)
Overall (excl. outliers)	71	-14.80 - 13	-1.03 (4.61)	-0.46 (0.29)	2.08 (0.56)
Clinical group	35	-14.80 - 13	-0.99 (5.14)	-0.30 (0.40)	2.77 (0.78)
Controls	37	-11.38 - 14	-0.66 (4.74)	0.16 (0.39)	1.95 (0.76)
Controls (excl. outliers)	36	-11.38 -5.62	-1.07 (4.10)	-0.81 (0.39)	0.38 (0.77)

[35] One-tailed one-sample *t*-tests were also performed to test if the reporting error in height is significantly different from zero, and the results were not different.

[36] One-tailed one-sample *t*-tests were also performed for the reporting error in weight, and the results were not different.

Reporting error and group differences. Participants were classified into those who have been weight-restored from anorexia nervosa and healthy controls based on a case-control design. The mean age was 22.83 years in the clinical group and 23.08 years in the control group. The difference between the two groups was not significant, $t(70) = 0.27$, $p = .79$. An individual matching was also performed, by pairing each case with one or more controls of the same age or ± 5 years. Those in the clinical group had lower BMIs ($M = 21.44$, $SD = 2.63$) than those in the healthy control group ($M = 22.59$, $SD = 3.35$), but not significantly different, $t(70) = 1.62$, $p = .11$. As expected by virtue of prior diagnosis, those in the clinical group had significantly higher scores on the EDE-Q Global ($M = 1.64$, $SD = 1.02$) compared to the healthy controls ($M = 0.66$, $SD = 0.68$), $t(59.17) = -4.76$, $p < .001$, and significantly higher scores on the Negative Perfectionism subscale ($M = 63.66$, $SD = 16.22$) compared to controls ($M = 52.22$, $SD = 12.42$), $t(70) = -3.37$, $p = .001$.

There was a non-significant difference between the clinical sample and healthy controls on the reporting error in height, $t(70) = 0.89$, $p = .38$, $d = 0.21$[37]. An independent samples t-test was also performed after excluding outliers and the difference was also not significant, $t(69) = 1.90$, $p = .06$, $d = 0.45$[38].

There was a non-significant difference between the clinical group and healthy controls on the reporting error in weight, $t(70) = 0.28$, $p = .78$, $d = 0.07$[39]. An independent samples t-test was also performed after excluding the outliers and the difference was not significant, $t(69) = -0.07$, $p = .94$, $d = 0.02$[40].

Overall, no significant differences were found on mean reporting error in height and weight between participants who have been weight-restored from anorexia nervosa and healthy controls.

Reporting error and eating disorder symptomatology. Table 5.2 presents correlations between the reporting error in height and weight and the EDE-Q scores. No significant correlations were found between the reporting error in height and weight and the EDE-Q scores for the overall sample and subgroups.

Reporting error and perfectionism. Table 5.3 presents correlations between the reporting error in height and weight and scores from the perfectionism scale. There was

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[37] A Mann-Whitney Test also indicated that this difference was not significant, $U = 498$, $Z = -1.72$, $p = .09$.

[38] A Mann-Whitney Test also indicated that the difference was not significant, $U = 461$, $Z = -1.97$, $p = .05$.

[39]A Mann-Whitney Test indicated that the difference was not significant, $U = 601.50$, $Z = -.52$, $p = .60$.

[40] A Mann-Whitney Test indicated that this difference was not significant, $U = 601.50$, $Z = -.33$, $p = .74$.

only a significant positive correlation between positive perfectionism and reporting error in weight in healthy controls, $r = .38$, $p = .02$. Healthy controls with higher scores on the positive perfectionism subscale tend to underestimate their weight less than those with lower scores. This correlation was no longer significant when the outliers were excluded from the analysis.

We also compared the correlations between positive perfectionism and reporting error in weight in the clinical ($r = .11$) and healthy control ($r = .38$) groups to examine if the correlations were significantly different for the two groups. A non-significant difference was found between the two correlations, $z = -1.18$, $p = .12$, suggesting that the relation between positive perfectionism and reporting error in weight did not significantly differ in the two groups.

Table 5. 2. *Correlations of the reporting error in height and weight with EDE-Q scores*

	Sample					
Measure	Overall	Overall (excl. outliers)	Clinical	Clinical (excl. outliers)	Controls	Controls (excl. outliers)
Reporting error in height						
EDE-Q Restraint	.05	-.13	.16	-.02	-.07	-.07
EDE-Q Eating	.10	-.05	.31	.19	-.12	-.12
EDE-Q Shape	-.01	-.03	.13	.25	-.16	-.16
EDE-Q Weight	.05	-.06	.23	.19	-.15	-.15
EDE-Q Global	.05	-.07	.24	.17	-.14	-.14
Reporting error in weight						
EDE-Q Restraint	.05	.09	.07	.07	.06	.16
EDE-Q Eating	.09	.10	.03	.03	.26	.24
EDE-Q Shape	-.01	.00	-.09	-.09	.14	.13
EDE-Q Weight	.06	.08	.02	.02	.21	.21
EDE-Q Global	.05	.07	.003	.003	.20	.20

Table 5. 3. *Correlations of the reporting error in height and weight with Perfectionism scores*

	Sample					
Measure	Overall	Overall (excl. outliers)	Clinical	Clinical (excl. outliers)	Controls	Controls (excl. outliers)
Reporting error in height						
Positive	.17	.05	.22	.02	.08	.08
Negative	.03	-.12	.23	.11	-.25	-.25
Reporting error in weight						
Positive	.22	.18	$.11^{a}$	.11	$.38^{*a}$	.31
Negative	.11	.08	.04	.04	.26	.16

Note. * $p < .05$; the ^{a} superscripts indicate a non-significant difference in z-test for the comparison of two correlation coefficients.

Discussion

The present study aimed to examine the differences between self-reports and measurements of height and weight and the role of eating disorder symptomatology and perfectionism in relation to the accuracy of self-reports among females who have been weight-restored from anorexia nervosa and healthy females with no history of eating disorders. To our knowledge, this is the second study that examined the accuracy of reporting of height and weight in females who have been weight-restored from anorexia nervosa compared to healthy females. Unlike Wolfe et al.'s (2013) study, the present study collected self-reports and actual measurements of height and weight with no time difference, and therefore the misreporting could not be attributed to any environmental or time factors. In addition, clinical and healthy control groups were matched on age in the current study; therefore any differences or similarities between the two groups can be attributed to the identification of the groups and not to other factors.

The results of the study suggest that there were differences between self-reports and actual measurements of height and weight. Nevertheless, the mean reporting error in weight was not significantly different from zero for all groups, and the mean reporting error in height was significantly different from zero only for the control group. The findings were in the expected direction and in accordance to previous evidence on misreporting of height and weight in females with a prior diagnosis of anorexia nervosa and in healthy individuals (Gorber et al., 2007; Wolfe et al., 2013); however, they were non-significantly different from zero.

The non-significant results may indicate that females with a prior diagnosis of anorexia nervosa and healthy controls were relatively accurate reporters of their height and weight. Comparing our results with that of Wolfe et al.'s (2013), it seems that females in the present study overestimated their height and underestimated their weight in a smaller degree than females in their study. It may be possible that females in our study were relatively accurate reporters due to the design of the present study. Researchers that collected the data for the present secondary analysis did not withhold information that the individuals would be measured, as they were not specifically designed to look at the differences between self-reports and measurements of height and weight; however it was also not emphasised per se. Therefore, the potential expectation about the impending actual measurements could have an impact on the participants' self-reports. It could be also that in Wolfe et al.'s (2013) study there was a higher sample size; 45 females who have been weight-restored from anorexia, and 71 healthy females, compared to the sample size of the present study. In addition, in Wolfe and colleagues' study (2013) actual measurements of height and weight were not collected right after the self-reports. This methodological issue may have introduced additional variance in reporting errors.

In line with Wolfe et al.'s (2013) study, we found that females who have been weight-recovered from anorexia nervosa were not significantly different from their healthy control counterparts in their self-reports of height and weight. The absence of any differences in height and weight reporting between the two groups might reflect that females who have been weight-restored from anorexia return to a mode that is similar to controls. Possibly females with a prior diagnosis of anorexia nervosa and healthy controls are not so preoccupied with their body shape and weight, unlike those who are currently diagnosed with anorexia nervosa. It might be also that the two groups misreport their height and weight in a similar way, as they are both not aware of their actual values, possibly due to the fact that they do not measure themselves regularly or have frequent doctor visits, as those with a current diagnosis of anorexia nervosa.

Although the two groups behave in a similar way regarding the height and weight reporting as well as their BMIs are both in the normal range, clinicians should be cautious with individuals who have been weight-recovered from anorexia nervosa. Anorexia nervosa is a serious and complex condition with a high risk of relapse (Carter, Blackmore, Sutandar-Pinnock, & Woodside, 2004). Despite the fact that individuals who have been recovered from anorexia nervosa display improved attitudes towards weight and food, they may still have residual concerns about eating, shape and weight (Bachner-Melman et al., 2006; Lo Sauro, Castellini, Lelli, Faravelli, & Ricca, 2013). The significantly higher scores on the EDE-Q Global that we found among females who have been weight-restored from anorexia compared to healthy controls may indicate that they continue to display eating disordered attitudes even after their treatment. Weight-restored individuals may return to a healthy weight, but they may still have disordered eating attitudes that need careful monitoring from the health professionals.

Our findings also indicate that there were non-significant correlations between the reporting error in height and weight and the scores on the eating disorder symptomatology measure for all groups. In regards to the perfectionism scale, a positive significant correlation was found only between the reporting error in weight and positive perfectionism in healthy controls. Healthy control females with higher scores on positive perfectionism tend to underestimate their weight less than those with lower scores. It could be that individuals with positive perfectionism are more conscientious, and possibly this is the reason that they underestimate their weight less compared to others. Importantly, when outliers were excluded from the analysis, this correlation was no longer significant. The inability to find statistically significant associations may be due to sample size.

The present study has some limitations. The sample size was small, so future studies with larger sample sizes of the comparison groups are recommended. Even though the prevalence of anorexia nervosa is lower among males than females, future studies should include males with a prior diagnosis of eating disorders to extend the generalisability of the findings. Moreover, the present study did not include a matched sample of individuals with a current diagnosis of anorexia nervosa, or other eating disorders who are found to be rather accurate reporters (Gorber et al., 2007). It could be interesting to have a comparison of anorexia nervosa sample with those who have been weight-recovered and with healthy controls in regards to the accuracy of self-reports of height and weight. Lastly, due to the fact that the data were originally collected for a different purpose, the information about actual measurements was not withheld purposefully. This potential expectation of actual measurements may have had an influence on individuals' reporting.

Considering the strengths and limitations of this study, the findings suggest that there were differences between self-reports and actual measurements of height and weight among females who have been weight-restored from anorexia nervosa, and were quite similar to those of healthy control females; however, these differences are small and not significantly different from zero. Weight underreporting is usually larger in more general samples (see findings in Studies 1 and 2 of this dissertation). Even if individuals with a prior diagnosis of anorexia nervosa were relatively accurate reporters, they may continue to have concerns about their weight, shape and eating after their treatment, as evidenced by their scores on the eating disorder symptomatology measure. Health professionals should be cautious and carefully monitor individuals who have been weight-recovered from anorexia nervosa in order to prevent relapse. Whenever possible, actual measurements of height and weight should be taken, instead of relying on self-reports, together with a thorough assessment of eating and weight behaviours.

Chapter 6

Study 5: The differences between self-reports and measurements of height and weight by manipulating the awareness of impending actual measurements in university students

Introduction

Previous findings have shown that the reliance on self-reports of height and weight could result in overestimation or underestimation of those variables respectively, and consequently lead to misleading assessment and management of health issues, including obesity and eating disorders. The extent of the differences between self-reports and actual measurements of height and weight appears to vary according to individual characteristics, related to demographic, behavioural, psychological or personality factors. The factors that are associated with inaccurate self-reporting of height and weight is one issue. Finding ways to decrease or eliminate any reporting error in height and weight self-reports is a second one.

Earlier studies that examined the accuracy of self-reports of height and weight have identified various factors that appear to be related to reporting accuracy. Misreporting of height and weight differs for males and females. A higher degree of underestimation of weight was found among females than males (Gil & Mora, 2011; Gunnare et al., 2013), maybe because females give a greater emphasis on thinness, as well as due to the pressure they may perceive to conform to cultural norms for appearance (Polivy et al., 2014). In regards to height misreporting, there is a general trend for height overestimation in both males and females, with some studies supporting higher overestimation of height in males than females, or vice versa (Gorber et al., 2007).

Body dissatisfaction is defined as the negative attitude towards one’s body that results from a perceived discrepancy between the current and ideal body image (Cooper & Taylor, 1988). Body dissatisfaction has been identified as one of the most important risk factors for disordered eating and eating disorders (Stice, 2001). Females who are dissatisfied with their bodies believe that specific parts of them are too large and desire to achieve the ‘thin ideal’ (Gilbert, Crump, Madhere, & Schutz, 2009), while males desire to achieve the V-shaped figure with large biceps, chest and shoulders (Furnham, Badmin, & Sneade, 2002). Females are more likely to perceive themselves as overweight, while males are more likely to perceive themselves as underweight, when they are not (Furnham & Calnan, 1998). Previous findings suggested that body dissatisfaction was related to the underreporting of weight in females who desired to appear thinner (Elgar et al., 2005; Hildebrandt, Shiovitz, Alfano, & Greif, 2008; Kurth & Ellert, 2010; Rasmussen et al., 2007) and misreporting of muscle mass in males who desired to appear leaner and more muscular (Hildebrandt et al., 2008).

Non-clinical females who overestimate their weight are more likely to demonstrate disordered eating behaviours, such as meal skipping, binging, and purging, compared to those who either underestimate or accurately report their weight (Ambwani & Chmielewski, 2013; Conley & Boardman, 2007; Heilbrun & Friedberg, 1990). Those with eating disorder symptomatology seem to overreport their weight to hide their unhealthy weight behaviours and low weights from others (motivational distortion), or because of the distorted body image they have (perceptual bias) (Conley & Boardman, 2007). Eating disordered symptomatology did not significant predict inaccuracy in weight reporting among males (Ambwani & Chmielewski, 2013).

People who score high on the Fear of Negative Evaluation Scale tend to behave in ways in order to avoid the likelihood of being evaluated unfavorably by others and they are concerned with making good impressions on others (Leary, 1983). Fear of negative evaluation was previously found to be associated with body dissatisfaction and behaviours related to disordered eating (McClintock & Evans, 2001; Lundgren, Anderson, & Thompson, 2004). To our knowledge, no previous studies examined whether fear of negative evaluation is associated with inaccurate self-reporting of height and weight. It could be possible that people with high fear of negative evaluation scores will try to make good impressions and avoid negative evaluations by others. Thus, they may attempt to misreport their height and weight values, for instance when they are not satisfied with them, or when they think that they weigh too much (Sutin, 2013).

As indicated previously, social desirability refers to people's attempt to enhance socially desirable and minimise socially undesirable characteristics (DeMaio, 1984). Some researchers support that social desirability is a stable personality characteristic and respondents distort their answers due to the need for social approval or to conform to social standards (DeMaio, 1984). Based on this approach, Crowne and Marlowe (1964) developed a scale that measures the need for approval as a personality characteristic. Others support that social desirability is a response strategy in relation to particular items (DeMaio, 1984). Social desirability appears to be related to weight reporting accuracy. Females generally score higher in social desirability as a trait than males (Hebert, Chemow, Pbert, Ockene, & Ockene, 1995). Previous findings demonstrated that females who underestimated their weight showed higher scores on the positive impression management scale and on the Marlowe-Crowne Social Desirability Scale than those who overestimated their weight (Ambwani & Chmielewski, 2013; Larson, 2000). Males' weight reporting was not related to impression management scores (Ambwani & Chmielewski, 2013). Societal expectations to be thin appear more salient for females, and especially for young females (Garner, Garfinkel, Schwartz, & Thompson, 1980), so they may try to present themselves as being thinner than they are in reality (Polivy et al., 2014).

Lastly, the frequency of measurements of weight was associated with decreased reporting error (DelPrete, Caldwell, English, Banspach, & Lefebvre, 1992; Imrhan et al., 1996). For instance, it was found that individuals who weighed themselves more often estimated their weight more accurately (Gunnare et al., 2013; Imrhan et al., 1996; De Vriendt et al., 2009). Flood and colleagues (2000) found that females who weighed themselves at least once a month were more accurate reporters of their weight compared to those who weighed themselves less frequently. Among males, differences between those who weighed themselves frequently or non-frequently were not statistically significant. Frequency or recency of height measurements did not significantly correlate with the reporting error in height (Imrhan et al., 1996).

A literature review identified that there are some previous studies that have experimentally investigated the effect of different manipulations on the accuracy of self-reports of height and weight. Empirical evidence suggests that individuals are more accurate reporters of their height and weight when they know that actual measurements will be performed following self-reports compared to those who are unaware of upcoming measurements (Black, Taylor, & Coster, 1998; DeAndrea, Tong, Liang, Levine, & Walther, 2012; Imrhan et al., 1996). It could be possible that individuals who are informed that they will be measured following self-reporting are accurate reporters due to the potential embarrassment that would follow disclosure (DeAndrea et al., 2012). It could be that they know their actual height and weight values but they choose not to report them unless they are informed that these values will be verified (Vartanian & Germeroth, 2011). These results contradict the findings of Yoong and colleagues (2013) who found that informed individuals did not report their height and weight more accurately compared to the uninformed individuals. It could be that this difference in findings is due to the heterogeneous samples and methodologies. Yoong and colleagues (2013) examined general practice patients aged 18 to 70 years and above, while the other studies recruited mostly college students.

Some of these previous studies that examined the accuracy of self-reports of height and weight in the informed and uninformed groups performed further analyses to detect whether the accuracy was influenced by the awareness of actual measurements or by other factors. Imrhan and colleagues (1996) found that for height and weight, both knowledge of impending measurements and gender influenced the accuracy. Besides the fact that the informed participants were more accurate compared to the uninformed ones, males were more accurate than females for weight, and females were more accurate than males for height. No significant interactions were found; the differences in accuracy between males and females were the same across the knowledge groups, and vice versa. In addition, DeAndrea and colleagues (2012) have neither found an interaction between gender and knowledge nor a significant main effect of gender. Black and colleagues (1998) found that the informed participants have accurately reported their weight across the weight range, while the uninformed participants have reported their weight less accurately as their body weight increased.

Purpose of the study. For the present study, an experimental procedure was designed to examine the extent of the reporting error in height and weight by manipulating the awareness of making actual measurements of height and weight after the self-reports, in a sample of university students. Other variables that potentially influence the accuracy of height and weight self-reports such as demographics, body dissatisfaction, eating disorder risk, social desirability, fear of negative evaluation, frequency and recency of measurements were also recorded and accounted for. An effect of the awareness of actual measurements was hypothesised, while controlling for the effects of other factors that were individually examined in previous studies and were found to influence the accuracy of height and weight self-reports. More specifically, the research questions and hypotheses of the present study are as follows:

1. Are there are any differences between self-reports and measurements of height and weight in the informed vs. uninformed participants, and in males vs. females?
    - It is hypothesised that all groups will underestimate their weight and overestimate their height.
2. What is the extent of these differences between the informed vs. uninformed and males vs. females?
    - It is hypothesised that the informed participants will overestimate their height and underestimate their weight to a lesser extent than the uninformed participants.
    - It is also hypothesised that males will be more accurate than females in weight reporting, and females will be more accurate than males in height reporting.

3. Is there a relationship between body dissatisfaction, eating disorder risk, social desirability, fear of negative evaluation, frequency and recency of measurements and the reporting error in height and weight?

Method

Participants. A convenience sample of 250 university students ($N_{\text{males}} = 109$, $N_{\text{females}} = 141$) agreed to participate in a study investigating eating habits and behaviours (see Appendix H for the power analysis). Participants were recruited from the University of Cyprus (83.6%) and Neapolis University Pafos (16.4%). The majority of them were undergraduates (94.8%) and 3^{rd} year students (32%). Participants' age ranged from 18 to 55 years ($M = 21.81$, $SD = 4.64$). They were randomly assigned into two groups: those who were informed ($N = 126$), and those who were uninformed ($N = 124$) about actual height and weight measurements after the self-reporting stage.

Volunteers were excluded from the study if they had any metal implants (i.e., pacemakers, metal screws), were pregnant or currently breastfeeding as these may have an impact on body weight, had physical disabilities (i.e., sitting in a wheelchair, or having hearing/ visual impairments), or were non-Greek speakers.

Five participants, who were initially eligible to participate, were excluded from the study. The reasons that led to their exclusion were: a) failure to comply with the measurement guidelines and study protocol, and b) threats to internal validity due to diffusion of the manipulation.

The final sample included 245 participants ($N_{\text{males}} = 107$, $N_{\text{females}} = 138$). The majority of them were students from the University of Cyprus (84.9%), undergraduates (95.5%), and 3^{rd} year students (32.7%). Their age ranged from 18 to 55 years ($M = 21.67$, $SD = 4.57$). In total, 122 participants ($N_{\text{males}} = 53$, $N_{\text{females}} = 69$) were allocated to the informed group, and 123 participants ($N_{\text{males}} = 54$, $N_{\text{females}} = 69$) to the uninformed group.

Ethical approval. Ethical approval for the experimental procedure and data collection was provided by the Review Bioethics Committee for Biomedical Research of the Cyprus National Bioethics Committee (ΕΕΒΚ/ΕΠ/2018/42).

Measures

Demographics. Participants were asked to complete questions including demographic information, health problems, dieting, exercise, eating habits, as well as questions about how often they measure their height and weight, and when was the last time that they measured their height and weight.

The scales that were used in the present study were already translated and validated in the Greek language (see Appendix I) are listed below:

Body Areas Satisfaction Subscale (BASS). The Body Areas Satisfaction subscale (BASS) of the Multidimensional Body-Self Relations Questionnaire-Appearance Scales (MBSRQ-AS; Cash, 2000) is a 9-item measure that assesses dissatisfaction or satisfaction with specific body areas, i.e., face, hair, lower torso, mid-torso, upper torso, muscularity, weight, height, and overall appearance, on a 5-point scale (1 = very dissatisfied to 5 = very satisfied). The BASS score is the mean of the 9 items. Those who score high on the subscale are generally satisfied with most body areas, and those who score low are dissatisfied with the size or appearance of several body areas. The internal consistency coefficients of the subscale were .77 for males and .73 for females, and 1-month test-retest reliability coefficients were .86 for male and .74 for female college students (Cash, 2000). The subscale was translated following a forward and backward translation method and validated in Greek (Argyrides & Kkeli, 2013). The Cronbach's α coefficient was .86, and the test-retest reliability was $r = .75$ for the Greek version of the BASS (Argyrides & Kkeli, 2013). In the present study, the internal consistency of the subscale was good, $\alpha = .81$. A principal component analysis was conducted on the 9 items with varimax rotation. The Kaiser-Meyer-Olkin measure was above the acceptable limit of .5 (KMO = .84) and the Bartlett's test of sphericity suggested that the data matrix was significantly different from an identity matrix. Two components had eignevalues over Kaiser's criterion of 1 and in combination explained 56.26% of the variance. The items loading on the first component (41.65% of the variance explained) represented characteristics of the body and the items loading on the second component represented characteristics of the face and hair.

Eating Attitudes Test (EAT-26). The Eating Attitudes Test (EAT-26; Garner, Olmsted, Bohr, & Garnfinkel, 1982) is one of the most widely used self-report measures for screening symptoms and features of eating disorders and disordered eating. It consists of three subscales (Dieting, Bulimia and Food Preoccupation, and Oral Control) and a composite total score. The items of the scale are rated on a 6-point Likert-type scale ranging from Always (1) to Never (6). The subscale scores are computed by adding together all items assigned to each particular subscale. A score at or above 20 indicates great concerns about dieting, weight or problematic eating behaviours and identifies individuals who need evaluation for eating disorders (Dotti & Lazzari, 1998; Patton, Johnson-Sabine, Wood, Mann, & Wakeling, 1990). The scale alone does not provide a diagnosis of an eating disorder (Garner et al., 1982). The internal consistency of the EAT-26 was found to be high for females with anorexia nervosa ($\alpha = .90$) and female university students ($\alpha = .83$) (Garner et al., 1982). The EAT-26 has been validated in Greek-Cypriot female university students with good psychometric properties ($\alpha = .87$ for the total score)

(Argyrides & Kkeli, 2015). The Cronbach's α coefficient of the scale was .80 in the present study. A principal component analysis was conducted with varimax rotation. The Kaiser-Meyer-Olkin measure was above the acceptable limit of .5 (KMO = .79) and the Bartlett's test of sphericity suggested that the data matrix was significantly different from an identity matrix. Eight components had eigenvalues over Kaiser's criterion of 1 and in combination explained 63.6% of the variance.

Weight Concerns Scale (WCS). The Weight Concerns Scale (WCS; Killen et al., 1994) was designed to assess individuals' fear of weight gain, worry about weight and body shape, importance of weight, history of dieting, and perceived fatness. It is a screening instrument that identifies individuals with high risk for developing an eating disorder (Rodgers & Franko, 2015). The measure was associated with the onset of eating disorder symptomatology over a period of three years in young adolescent girls (Killen et al., 1994). The WCS is a one-dimensional measure consisting of five questions using a 4- to 7-point Likert-type scale. Items 1, 2, and 5 range from 1 to 5. Item 3 uses a 7-point scale and item 4 a 4-point scale. Item scores range from 0 to 100 (Killen et al., 1994) and the scale score representing the average of all items, with higher scores representing increased weight and shape concerns (Jacobs-Pilipski, Winzelberg, Wifley, Bryson & Taylor, 2005; Kass, 2011). A score of 57 or above indicated a high risk for developing eating disorders in adolescent girls (Killen et al., 1996). The measure was found to have good test-retest reliability for a 7-month interval (r = .71; Killen et al., 1994) and a 12-month interval (r = .75; Killen et al., 1996). The measure was translated in Greek and had satisfactory internal consistency in university male and female students (α = .75) and middle and high school male and female students (α = .80) (Koushiou, 2016). The α of the scale was .77 in the present study. A principal component analysis was conducted. The Kaiser-Meyer-Olkin measure was above the acceptable limit of .5 (KMO = .78) and the Bartlett's test of sphericity suggested that the data matrix was significantly different from an identity matrix. The items loaded on one component as expected and explained 53.18% of the variance.

Marlowe-Crowne Social Desirability Scale (MCSD). The Marlowe-Crowne Social Desirability Scale (MCSD; Crowne & Marlowe, 1960) is a 33-item scale; 18 items are keyed true and 15 false, which reflects the tendency of individuals to seek approval or avoid disapproval by responding in a culturally appropriate way (Crowne & Marlowe, 1960; Paulhus, 1991). Scores range from 0 to 33, with higher scores reflecting higher need for approval (Paulhus, 1991). The internal consistency of the 33 items was .88, and the test-retest reliability was .89 (Crowne & Marlowe, 1960). Shorter versions of the scale were developed in subsequent years. One of these versions is the 13-item scale developed by Reynolds (1982). The 13-item scale is formed with items 3, 6, 10, 12, 13, 15, 16, 19, 21, 26, 28, 30, and 33 of the original scale. The internal consistency of the scale was found to be .76 (Reynolds, 1982). The scale was also highly correlated with the original MCSD (r = .93; Reynolds, 1982). The 13-item scale is scored by adding 1 point for each 'True' answer to items 5, 7, 9, 10, and 13 and 0 points for each 'False' answer to these items, and by adding 1 point for each 'False' answer to items 1, 2, 3, 4, 6, 8, 11, and 12 and 0 points for each 'True' answer to these items. Scores range from 0 to 13. The 13-item scale has been recently translated and adapted in Greek (Michaelides, personal communication). The internal consistency of the scale was low in the present study (α = .58).

Brief Fear of Negative Evaluation Scale (BFNE). The construct of fear of negative evaluation was originally defined by Watson and Friend (1969) as 'apprehension about others' evaluations, distress over their negative evaluations, avoidance of evaluative situations, and the expectation that others would evaluate oneself negatively' (p. 449). Leary (1983) developed a brief version of the Fear of Negative Evaluation scale (FNE; Watson and Friend, 1969). The Brief Fear of Negative Evaluation Scale (BFNE) is a 12-item measure; eight of the items are straightforwardly worded and four are reverse-worded, using a 5-point Likert-type scale ranging from 0 (Not at all characteristic of me) to 4 (Extremely characteristic of me). The internal consistency of the BFNE was between .90 and .91 and the test-retest reliability was .75 over a 4-week period in undergraduate samples (Leary, 1983). At present, there are several versions of the BFNE available. The Brief Fear of Negative Evaluation (Rodebaugh et al., 2004; Weeks et al., 2005) consists of eight straightforwardly worded items (i.e., items 1, 3, 5, 6, 8, 9, 11, 12) from the BFNE (Leary, 1983). The authors have suggested using only the eight straightforwardly worded items to calculate the total score as these items were found to be more reliable and valid indicators of the fear of negative evaluation than the reverse-worded items in undergraduate students and clinical samples (Carleton, Collimore, McCabe & Antony, 2011). The internal consistency of the scale was >.92 in undergraduate (Rodebaugh et al., 2004) and clinical samples (Carleton et al., 2011; Weeks et al., 2005). An alternative to removing or not scoring the reverse-worded items, is the Brief Fear of Negative Evaluation (Carleton, McCreary, Norton, & Asmundson, 2006) which consists of 12 items; the eight items that were originally straightforwardly worded (i.e., items 1, 3, 5, 6, 8, 9, 11, 12) and the four items (i.e., items 2, 4, 7, 10) that were originally reverse-worded, revised to be straightforwardly worded. The items are rated on a 5-point Likert-type scale ranging from 0 (Not at all characteristic of me) to 4 (Extremely characteristic of me). The internal consistency of the scale was >.95 in undergraduate students (Carleton et al., 2006) and clinical samples (Carleton et al., 2011; Collins, Westra, Dozois, & Stewart, 2005). The test-retest correlation was .94 over a 2-week interval in clinical samples (Collins et al., 2005). Factor analyses have supported a unidimensional factor structure (Carleton et al., 2006). The current scale was translated in Greek with very good psychometric properties. The BFNE scale developed by Carleton and colleagues (2006; Vassilopoulos, 2012 for the Greek version) was used in the present study. The internal consistency of the scale was high, Cronbach's α >.92 (Vassilopoulos, 2012; Vassilopoulos & Brouzos, 2012), and α = .94 in the present study. A principal component analysis was conducted on the items of the scale. The Kaiser-Meyer-Olkin measure was above the acceptable limit of .5 (KMO = .94) and the Bartlett's test of sphericity suggested that the data matrix was significantly different from an identity matrix. The items loaded on one component as expected and explained 60.55% of the variance.

Questionnaire about height and weight. Participants were also asked to complete their height and weight and how confident they were about their answers on a 3-point scale from Confident (1) to Not at all confident (3).

Procedure

Pilot study. A pilot study was conducted before the main data collection. Eight university students participated in order to evaluate the duration of the experiment, the procedure, and the questionnaires, and to test the equipment. Given their feedback and evaluation, the experiment was adjusted accordingly. The data collected during the pilot study were not used in the main data analysis.

Recruitment. After academic staff's approval, the researcher visited classes and invited university students to voluntarily participate in the study in exchange for course credit where applicable (i.e., Neapolis University does not give course credit for research participation) (see Appendix J). Individuals interested to participate were contacted by the researcher and informed about the general aim of the study and the exclusion criteria. Individuals who were eligible to participate were asked to arrange individual appointments to complete the questionnaires. Appointments were arranged either in the morning, or at a minimum two hours after lunch-time for all participants.

Experimental manipulation. The experiment took place in offices at the Psychology departments of the University of Cyprus and Neapolis University Pafos respectively. Upon arrival to the study, participants were informed about the study and asked to complete a consent form. They were then administered a questionnaire packet, including demographic information, and self-reported measures to screen for body dissatisfaction, eating disorder risk, social desirability, and fear of negative evaluation. During the completion of the questionnaires participants were left alone in the room.

Participants were then randomly assigned to either informed or uninformed conditions. Individuals in the informed condition were asked to self-report their height and weight after being informed that they will be measured afterwards. They were informed both verbally and in writing while they were asked to complete the section of height and weight self-reports. Participants in the uninformed condition were asked to report their height and weight unaware about the upcoming actual height and weight measurements. Random allocation of participants to the two conditions allowed for equal distribution of possible sources of error. All participants agreed to self-report their height and weight.

Following this, actual height and weight measurements were taken and recorded on a measurement form (Appendix K). Weight was measured with a Tanita WB 380S electronic scale, and height with Tanita Leicester Portable Height Measure. Participants were asked to remove their shoes, any items from their pockets, jewelry, hair ornaments, buns from the top of the head, and heavy clothing prior to measurements. According to the World Health Organization (WHO, 1995) guidelines, measurements were recorded to the nearest 0.1 cm and 0.1 kg. All participants agreed to be measured.

Participants who were assigned to the uninformed condition were subsequently asked additional questions to find out if they had perceived the experimental manipulation. The following questions were asked after actual measurements were taken: 1) What do you think was the purpose of the study? and 2) Did you suspect that your weight and height would be measured? (adaptation from Gravetter & Forzano, 2016).

All participants were then debriefed and explained the actual purpose of the study (see Appendix L). The importance of not sharing any information and details about the experiment with other students was particularly stressed out, to avoid any diffusion of the conditions and ensure the internal validity of the study. Then, participants were asked to provide a written consent whether they agree their data to be included in the data analysis, provided with contact details of the counseling centers of their universities and thanked for their participation.

Statistical analysis. We calculated the reporting error in height and weight using the following formulas:

$$\text{Reporting Error in height}_i = \text{Self-reported height}_i - \text{Measured height}_i \quad (6.1)$$

$$\text{Reporting Error in weight}_i = \text{Self-reported weight}_i - \text{Measured weight}_i \quad (6.2)$$

for each individual *i*. One-sample *t*-tests were used to determine whether the reporting error in height and weight differed significantly from 0. Cohen's *d* was used to evaluate the differences, with values of 0.2, 0.5, and 0.8 indicating small, medium and large effect sizes respectively (Cohen, 1992). Comparisons between experimental groups and gender on the reporting error in height and weight were performed. In addition, comparisons between experimental groups and gender, controlling for the scores on the body dissatisfaction, eating disorder risk, social desirability, fear of negative evaluation scales as well as the responses on frequency and recency of height and weight measurements were conducted. Although traditionally these comparisons are examined with two-way ANOVA and ANCOVA, we supplemented the analyses with the estimation of parameter estimates with heteroscedasticity-robust standard errors.

Results

Descriptives. Table 6.1 presents the descriptive statistics for the reporting error in height and weight in all groups. For the overall sample, the mean measured height was 167.33 cm, which was lower than the mean self-reported height of 169.50 cm. The mean measured weight was 68.57 kg, which was higher than the mean self-reported weight of 68.04 kg. The mean reporting error in height and weight is also presented in Table 6.1 for the informed and uninformed groups, and males and females. On average, height was overestimated and weight was underestimated for all groups.

Boxplots indicated that there were some extreme scores on the reporting error in height and weight (Figure 6.1). Two cases with reporting error in height | z-scores | > 3 were flagged as outliers. One case underestimated height (by -3.80 cm) and the other overestimated height (by 12 cm). Six cases with reporting error in weight | z-scores | > 3 were also flagged as outliers. Four cases underestimated weight (by -16.70, -13.70, -12.80, -11 kg) and two cases overestimated weight (by 7.50, 8.40 kg). The descriptive statistics for the main variables excluding the outliers are also presented in Table 6.1.

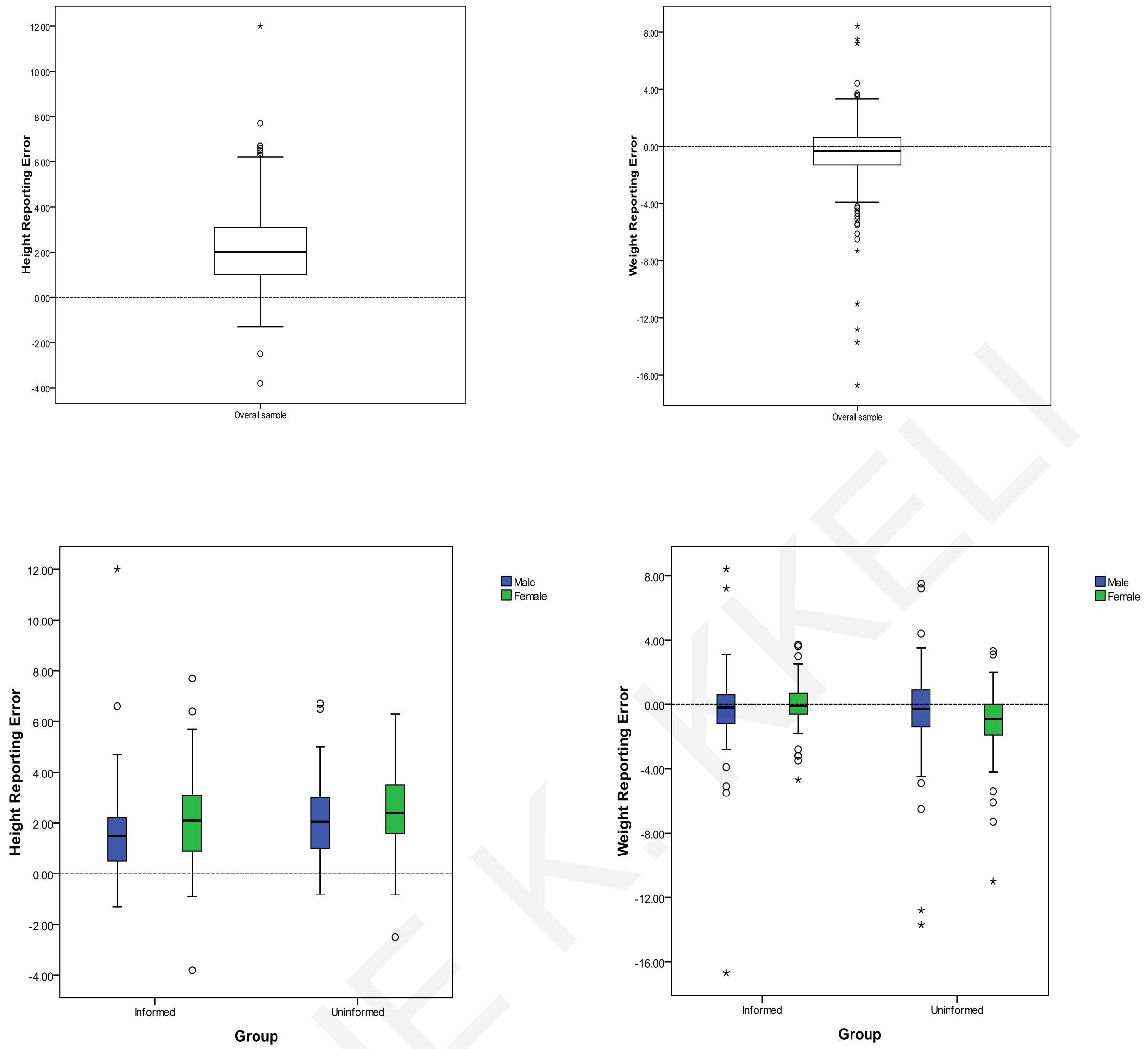

Figure 6. 1. Boxplots for the reporting error in height and weight for the overall sample and by group.

Table 6. 1. *Descriptive statistics for the reporting error in height and weight for the overall sample and by group*

Variable	*N*	Range	Mean (*SD*)	Skewness (*SE*)	Kurtosis (*SE*)
Reporting error in height (cm)					
Overall	245	-3.80 - 12	2.17 (1.91)	0.79 (0.16)	2.67 (0.31)
Overall (excl. outliers)	243	-2.50 - 7.70	2.16 (1.77)	0.48 (0.16)	0.24 (0.31)
Informed	122	-3.80 - 12	1.98 (2.03)	1.21 (0.22)	4.56 (0.44)
Informed (excl. outliers)	120	-1.30 - 7.70	1.95 (1.76)	0.70 (0.22)	0.57 (0.44)
Uninformed	123	-2.50 - 6.70	2.36 (1.77)	0.28 (0.22)	0.19 (0.43)
Males	107	-1.30 - 12	1.91 (1.96)	1.65 (0.23)	6.08 (0.46)
Males (excl. outliers)	106	-1.30 - 6.70	1.81 (1.70)	0.69 (0.24)	0.83 (0.47)
Females	138	-3.80 - 7.70	2.37 (1.86)	0.09 (0.21)	0.58 (0.41)
Females (excl. outliers)	137	-2.50 - 7.70	2.42 (1.79)	0.34 (0.21)	0.10 (0.41)
Reporting error in weight (kg)					
Overall	245	-16.70 - 8.40	-0.54 (2.66)	-1.76 (0.16)	10.51 (0.31)
Overall (excl. outliers)	239	-7.30 - 7.20	-0.39 (1.93)	-0.11 (0.16)	2.75 (0.31)
Informed	122	-16.70 - 8.40	-0.20 (2.42)	-2.18 (0.22)	18.65 (0.44)
Informed (excl. outliers)	120	-5.50 - 7.20	-0.14 (1.75)	0.15 (0.22)	3.06 (0.44)
Uninformed	123	-13.70 - 7.50	-0.87 (2.85)	-1.47 (0.22)	6.60 (0.43)
Uninformed (excl. outliers)	119	-7.30 - 7.20	-0.65 (2.07)	-0.15 (0.22)	2.50 (0.44)
Males	107	-16.70 - 8.40	-0.46 (3.38)	-1.67 (0.23)	8.12 (0.46)
Males (excl. outliers)	102	-6.50 - 7.20	-0.21 (2.15)	0.25 (0.24)	2.62 (0.47)
Females	138	-11 - 3.70	-0.60 (1.95)	-1.54 (0.21)	6.40 (0.41)
Females (excl. outliers)	137	-7.30 - 3.70	-0.52 (1.74)	-0.72 (0.21)	2.25 (0.41)

Tables 6.2 and 6.3 present results on the reporting error in height and weight and related questions separately for the informed and uninformed groups. Based on participants' answers, 54.7% of them measure their height once a year or less and only 1.2% have measured their height recently. In addition, 62.4% of participants reported that they exercise, 58% of them reported that they try to avoid fatty foods, 77.1% reported that they have a scale at home, 35.5% of them are trying to lose weight currently, 24.5% reported that they measure their weight once a month, and 53.1% have measured their weight more than a week ago.

Participants were asked to report their height and weight and how confident they were about their answers. Based on their responses, 7.3% and 3.7% of them were not at all confident about their weight and height self-reports respectively.

Participants in the uninformed group were asked whether they suspected that their height and weight would be measured. Based on their responses, 29.3% of them suspected that they would be measured, and 70.7% did not. We examined whether the reporting error in height and weight differed between those who suspected that they would be measured and those who did not. For the reporting error in weight, a non-significant difference was found between those who suspected that they would be measured (M = -1.32, SD = 2.73) and those who did not (M = -0.69, SD = 2.90), t(121) = -1.12, p = .27. For the reporting error in height, a non-significant difference was also found between those who suspected that they would be measured (M = 2.43, SD = 2.06) and those who did not (M = 2.33, SD = 1.66), t(121) = 0.28, p = .78.

In addition, based on participants' total scores on the EAT-26, 13.1% of them had great concerns about dieting, weight or problematic eating behaviours and they may need evaluation for eating disorders. Furthermore, based on their total scores on the WCS, 17.4% of them were at high risk for developing an eating disorder.

Table 6. 2. *Descriptive statistics for demographics with reporting error in height by group*

Variable		%	Mean Rep. Error (*SD*) Informed group	Uninformed group
How often do you measure your height?	Never	40.4	2.18 (2.47)	2.15 (1.77)
	Once a year or less	54.7	1.87 (1.74)	2.61 (1.76)
	Every 2 months	2.9	1.68 (0.64)	1.20 (2.40)
	Once a month	2	1.00 (-)	1.15 (1.41)
When was the last time you measured your height?	Within the last week	1.2	-	1.63 (0.68)
	More than a week ago	81.6	2.03 (2.11)	2.46 (1.75)

Note. Percentages may not add up to 100% due to missing values (e.g., participants could not remember).

Table 6. 3. *Descriptive statistics for demographics with reporting error in weight by group*

Variable		%	Mean Rep. Error (*SD*) Informed	Uninformed
Exercise	Yes	62.4	0.11 (1.93)	-0.66 (2.83)
	No	37.6	-0.84 (3.14)	-1.16 (2.88)
Health problem	Yes	15.5	-0.65 (3.78)	-1.32 (3.90)
	No	83.3	-0.07 (1.97)	-0.83 (2.72)
Eating/weight problem	Yes	27.8	-0.49 (1.44)	-0.99 (2.89)
	No	71.8	-0.06 (2.69)	-0.82 (2.85)
Dieting to lose weight	Yes	22.9	-0.31 (1.79)	-1.34 (2.71)
	No	76.7	-0.18 (2.57)	-0.67 (2.88)
Trying to lose weight with	Yes	2	0.22 (0.98)	-
other ways	No	98	-0.22 (2.47)	-0.87 (2.85)
Avoiding fatty foods	Yes	58	-0.27 (1.61)	-1.13 (2.64)
	No	41.6	-0.25 (3.15)	-0.54 (3.09)
Scale at home	Yes	77.1	-0.23 (2.55)	-0.65 (2.23)
	No	22.4	-0.14 (2)	-1.60 (4.32)
Describe yourself as	Underweight	7.3	-0.26 (1.42)	0.01 (0.92)
	Normal weight	73.1	0.10 (1.97)	-0.72 (2.66)
	Overweight	15.9	-0.56 (1.82)	-1.90 (4.08)
	Obese	3.3	-3.18 (6.87)	-2.00 (0.71)
What are you doing for your	Lose weight	35.5	-0.27 (1.65)	-1.16 (2.70)
weight?	Gain weight	15.1	-0.03 (1.71)	0.22 (2.27)
	Same weight	26.5	0.31 (2.33)	-0.31 (2.01)
	Nothing	22.9	-1.02 (3.76)	-1.47 (3.72)
How often do you measure	Never	1.6	0.40 (-)	-0.47 (1.29)
your weight?	Once a year or less	20.4	0.03 (1.87)	-1.63 (4.54)
	Every 2 months	16.7	-0.28 (2.49)	-1.13 (2.90)
	Once a month	24.5	-0.32 (3.82)	-0.31 (2.12)
	Every 2 weeks	9.8	-0.03 (1.75)	-0.09 (1.49)
	Once a week	15.9	-0.06 (1.57)	-0.75 (2.19)
	Everyday	11	-0.55 (1.01)	-1.44 (1.87)
When was the last time you	Within the last week	41.6	-0.50 (2.60)	-0.53 (1.57)
measured your weight?	More than a week ago	53.1	0.16 (2.26)	-1.09 (3.12)

Note. Percentages may not add up to 100% due to missing values.

One-sample t-tests. One-sample *t*-tests (two-tailed) indicated that on average, participants overestimated their height and this was significantly different from zero for the overall sample and all subgroups, with large effect sizes. They also underestimated their weight and this was significantly different from zero for the overall sample and all subgroups, except the informed group and males, with small effect sizes. Participants in the informed group and males were on average quite accurate reporters of their weight[41].

Table 6. 4. *Results of one-sample t-tests for reporting error in height and weight*

Variable	*t*	*df*	*d*
Reporting error in height			
Overall	17.75**	244	1.13
Overall (excl. outliers)	18.94**	242	1.21
Informed	10.75**	121	0.97
Informed (excl. outliers)	12.13**	119	1.11
Uninformed	14.75**	122	1.33
Males	10.08**	106	0.97
Males (excl. outliers)	10.98**	105	1.07
Females	14.99**	137	1.28
Females (excl. outliers)	15.82**	136	1.35
Reporting error in weight			
Overall	-3.16*	244	-0.20
Overall (excl. outliers)	-3.13*	238	-0.20
Informed	-0.92	121	-0.08
Informed (excl. outliers)	-0.86	119	-0.08
Uninformed	-3.38*	122	-0.31
Uninformed (excl. outliers)	-3.41*	118	-0.31
Males	-1.41	106	-0.14
Males (excl. outliers)	-1.00	101	-0.10
Females	-3.61**	137	-0.31
Females (excl. outliers)	-3.52*	136	-0.30

* $p < .05$, ** $p < .001$

[41] One-tailed one-sample *t*-tests were also performed to test if the reporting errors in height and weight are significantly different from zero, and the results were not different.

Correlations between reporting error in height and weight and measures. Table 6.5 presents the means and standard deviations for all measures and Pearson's *r* correlation coefficients among all main variables. Higher satisfaction with appearance of body areas correlated with lower concerns about dieting, weight and problematic eating behaviour, with decreased weight and shape concerns, with lower fear of negative evaluation, and with higher need for approval. Higher concerns about dieting, weight and problematic eating behaviour associated with females, related with increased weight and shape concerns and with higher fear of negative evaluation as well as with more frequent and recent weight measurements. Increased weight and shape concerns associated with females, related with higher fear of negative evaluation as well as with more frequent and recent weight measurements. Higher need for approval and fear of negative evaluation were associated with females. Higher need for approval was related with lower fear of negative evaluation. This result is consistent with the findings of Watson and Friend (1969) who found a negative relationship between fear of negative evaluation and social desirability. Higher fear of negative evaluation was associated with more frequent height measurements. Not surprisingly, more frequent height and weight measurements were associated with more recent measurements of height and weight. It is important to note that the internal consistency of the MCSD scale is poor and therefore any correlations with this scale should be interpreted with caution.

Table 6. 5. *Means, standard deviations and correlations of reporting error in height and weight and main variables*

Scales (Range)	Mean	*SD*	Group	Sex	Rep. error weight	Rep. error height	1	2	3	4	5	6	7	8
1.BASS (1-5)	3.54	0.61	.03	-.02	.06	-.05	1							
2. EAT (0-78)	9.91	8.02	.05	$.14^{*}$	-.10	.08	$-.30^{**}$	1						
3. WCS (0-100)	32.76	22.45	.03	$.27^{**}$	-.10	.04	$-.50^{**}$	$.61^{**}$	1					
4. MCSD (0-13)	7.84	2.43	-.01	$.13^{*}$	.07	.05	$.17^{*}$	-.05	-.06	1				
5. BFNE (0-48)	21.36	10.82	.02	$.16^{*}$	.08	.12	$-.24^{**}$	$.34^{**}$	$.34^{**}$	$-.33^{**}$	1			
6. WF	4.12	1.69	-.02	-.03	.02	$-.23^{**}$	-.12	$.24^{**}$	$.31^{**}$	-.03	.10	1		
7. WR	1.56	0.50	-.01	-.03	.01	$.15^{*}$	.06	$-.19^{*}$	$-.23^{**}$	-.05	-.07	$-.71^{**}$	1	
8. HF	1.67	0.64	.03	.05	.01	-.05	-.001	.09	.12	.03	$.18^{*}$	.10	-.10	1
9. HR	1.99	0.12	-.12	-.11	.07	.04	-.02	.10	-.06	-.08	-.02	-.03	.06	$-.19^{*}$

Note. $^{*}p < .05$, $^{**}p < .001$; Group: 1 = Informed, 2 = Uninformed; Sex: 1 = Male, 2 = Female; BASS = Body Areas Satisfaction Subscale; EAT = Eating Attitudes Test; WCS = Weight Concerns Scale; MCSD = Marlowe-Crowne Social Desirability Scale; BFNE = Brief Fear of Negative Evaluation Scale; WF = Weighing Frequency (1 = Never to 8 = More than once a day); WR= Recency of weight measurement (1 = Within the last week; 2 = More than a week ago); HF = Frequency of height measurement (1 = Never to 8 = More than once a day); HR= Recency of height measurement (1 = Within the last week; 2 = More than a week ago)

Comparisons Between Experimental Groups and Gender

Reporting error in weight. A two-way factorial ANOVA with group (aware, unaware) and gender (males, females) entered as the independent variables/ predictors and the reporting error in weight as the dependent variable was also performed. There was violation of the assumption of homogeneity of variance, $F(3, 241) = 3.26$, $p = .02$. The interaction between the group and gender on the reporting error in weight was non-significant, $F(1, 241) = 1.44$, $p = .23$, partial $\eta^2 = 0.006$. There was a non-significant main effect of group on the reporting error in weight, $F(1, 241) = 3.26$, $p = .07$, partial $\eta^2 = 0.01$. There was also a non-significant main effect of gender on the reporting error in weight, $F(1, 241) = 0.17$, $p = .68$, partial $\eta^2 = 0.001$. Given that the homogeneity of variance was not met, we estimated parameters and their standard errors with a method that is robust to violations of assumptions. Heteroscedasticity-consistent standard errors, *t*-statistics and significance values were used (HC3 estimates), since unequal variances bias the estimate of the standard error associated with the parameter estimates (Hayes & Cai, 2007). Participants in the informed group significantly differed from those in the uninformed group (reference group) in their reporting error in weight, $b = 1.03$, $p = .002$. Specifically, those in the informed group ($M_{\text{adjusted}} = -0.22$, $SE = 0.24$) underestimated their weight significantly less than those in the uninformed group ($M_{\text{adjusted}} = -0.84$, $SE = 0.24$). Males did not significantly differ from females (reference group) in their reporting error in weight, $b = 0.55$, $p = .32$. The difference between the informed and uninformed groups in males was not significantly different to the same difference in females, $b = -0.82$, $p = .27$.

Reporting error in height. A two-way factorial ANOVA was conducted with group (aware, unaware) and gender (males, females) as the independent variables/ predictors and the reporting error in height as the dependent variable. The assumption of homogeneity of variance was not violated, $F(3, 241) = 0.15$, $p = .93$. The interaction between the group and gender on the reporting error in height was non-significant, $F(1, 241) = 0.20$, $p = .65$, partial $\eta^2 = 0.001$. There was a non-significant main effect of group on the reporting error in height, $F(1, 241) = 2.61$, $p = .11$, partial $\eta^2 = 0.01$. There was also a non-significant main effect of gender on the reporting error in height, $F(1, 241) = 3.66$, $p = .06$, partial $\eta^2 = 0.02$. The parameter estimates robust to heteroscedasticity (HC3 estimates) gave the same picture: participants in the informed group did not significantly differ from those in the uninformed group (reference group), $b = -0.29$, $p = .37$; males did not significantly differ from females (reference group), $b = -0.36$, $p = .27$, and the difference between the informed and uninformed groups in males was not significantly different to the same difference in females, $b = -0.22$, $p = .66$.

Parameter estimates with robust standard errors after removing outliers led to the same conclusion as the analysis reported above.

Comparisons Between Experimental Groups and Gender Controlling for Other Variables

Reporting error in weight. A two-way ANCOVA was performed with group and gender as the independent variables and the reporting error in weight as the dependent variable, adjusting for the influence that the scores of the BASS, EAT, WCS, MCSD, BFNE scales, and the responses on frequency and recency of weight measurements, have on the reporting error in weight. The assumption of homogeneity of variance was not violated, $F(3, 225) = 2.44$, $p = .07$. Controlling for the effect of the seven variables, a non-significant interaction between group and gender on the reporting error in weight was found, $F(1, 218) = 1.14$, $p = .29$, partial $\eta^2 = 0.005$. There was a significant effect of group on the reporting error in weight, $F(1, 218) = 4.16$, $p = .04$, partial $\eta^2 = 0.02$. There was a non-significant effect of gender on the reporting error in weight, $F(1, 218) = 0.42$, $p = .52$, partial $\eta^2 = 0.002$. The BFNE score was significantly related to the reporting error in weight, $F(1, 218) = 5.94$, $p = .02$, partial $\eta^2 = 0.03$. As fear of negative evaluation increases, the underestimation of weight tends to be less pronounced. When the parameter estimates with robust standard errors were used, it was found that participants in the informed group significantly differed from those in the uninformed group (reference group) in their reporting error in weight after removing the effect of the variables examined, $b = 1.03$, $p = .003$. Participants in the informed group ($M_{\text{adjusted}} = -0.16$, $SE = 0.24$) underestimated their weight significantly less than those in the uninformed group ($M_{\text{adjusted}} = -0.80$, $SE = 0.23$). The parameter estimates robust to heteroscedasticity showed that the BFNE score was non-significant, $b = 0.04$, $p = .07$. Gender and group x gender interaction did not have significant parameter estimates robust to heteroscedasticity.

Reporting error in height. A two-way ANCOVA was performed with group and gender as the independent variables and the reporting error in height as the dependent variable, adjusting for the influence that the scores of the BASS, EAT, WCS, MCSD, BFNE scales and the responses on frequency and recency of height measurements, have on the reporting error in height. The assumption of homogeneity of variance was not violated, $F(3, 196) = 0.49$, $p = .69$. Controlling for the effect of the seven variables, a non-significant interaction between group and gender on the reporting error in height was found, $F(1, 189) = 0.07$, $p = .79$, partial $\eta^2 = 0.000$. There was also a non-significant effect of group on the reporting error in height, $F(1, 189) = 2.46$, $p = .12$, partial $\eta^2 = 0.01$, and a non-significant effect of gender on the reporting error in height, $F(1, 189) = 3.61$, $p = .06$, partial $\eta^2 = 0.02$. We also applied a robust test to check whether the results concur. The parameter estimates robust to heteroscedasticity (HC3 estimates) support that the group and gender, or their interaction, and the seven variables were non-significant.

Separate ANCOVAs with each of the seven variables entered individually as a covariate agreed with the results above for both height and weight comparisons. Each variable was not significant, while the effect of group membership was significant in the case of the reporting error in weight.

All analyses were repeated after removing outliers with no change in the robust parameter estimates for the reporting error in height comparisons. For the reporting error in weight comparisons, the effect of group was again found to be significant when the covariates were entered simultaneously. The parameter estimates robust to heteroscedasticity showed that the BFNE score was marginally significant ($b = 0.03$, $p = .04$). Separate models were run with individual covariates: no significant effects were found for height. For weight, group was always significant with robust parameter estimates.

The results of the study indicate that participants in the informed group did not significantly differ from those in the uninformed group in regards to the reporting error in height; neither males significantly differed from females in their reporting error in height and weight. The findings suggest that the informed group significantly differed from the uninformed group in their weight reporting error; specifically those in the uninformed group underestimated their weight more compared to those in the informed group. The effect of group was also significant after controlling for the potential influence of psychological, behavioural and personality factors. From the potential covariates, only fear of negative evaluation seemed to be related to the reporting error in weight.

Discussion

The present study aimed to examine the extent of the reporting error in height and weight by manipulating the awareness of making actual measurements of height and weight after the self-reporting stage in a university student sample. Body dissatisfaction, eating disorder risk, social desirability, fear of negative evaluation, frequency and recency of height and weight measurements that were found to influence the accuracy of self-reports of height and weight in previous studies were recorded and accounted for. To our knowledge, this is the first study that examined the accuracy of height and weight self-reports by manipulating the information of measurements after the self-reports controlling for these specific variables.

First, based on previous research (Gorber et al., 2007) and the findings of previous chapters (see Studies 1, 2 and 4), a trend towards overestimation of height and underestimation of weight for all groups was expected. Results supported the hypothesis with the overall sample and all subgroups overreporting their height on average. Height overestimation was significantly different from zero for all participants, with large effect sizes. All groups also underestimated their weight with small effect sizes. The underestimation of weight was not significantly different from zero for the informed group and males. Participants in the informed group and males tended to report their weight relatively accurate.

Second, the results supported the hypothesis that the informed participants significantly differed on their weight reporting accuracy from the uninformed participants. In line with previous research that experimentally examined the effect of the awareness of actual measurements on the accuracy of self-reports of height and weight (Black et al., 1998; DeAndrea, et al., 2012; Imrhan et al., 1996), it was found that participants in the informed group underestimated their weight significantly less than those in the uninformed group. The effect of group was also significant after controlling for the effect of psychological, personality and behavioural factors that were previously found to have an effect on the accuracy of self-reports of height and weight. It can be concluded that the knowledge about upcoming weight measurements after the self-reports predicts less reporting error in weight. Possibly the potential embarrassment after the disclosure of actual weight leads the informed participants to be more accurate reporters of their weight (DeAndrea et al., 2012). The results could also suggest that individuals know their actual weight but they choose not to report it accurately unless they are informed that actual measurements will be followed (Vartanian & Germeroth, 2011). Participants' responses appear to support the assumption that they know how much they weigh; since the majority of them have scales on their homes and also appear to weigh themselves very often.

Based on Imrhan et al.'s (1996) results, it was expected that the gender of participants will have an effect on the weight reporting accuracy. Specifically, it was expected that males will be more accurate than females in the self-reports of weight. However, the findings of the present study did not confirm that the gender of participants influenced their weight reporting; the accuracy of self-reports of weight was influenced by the information that actual weight measurements would be followed after the self-reports irrespective of their gender.

Previous research has shown that the informed participants were more accurate reporters of their height compared to the uninformed participants (Imrhan et al., 1996). The results of the current study also support that the uninformed participants reported their height less accurately, as they overestimated their height more, compared to the informed participants. However, the reporting error in height did not significantly differ across the two groups. Thus, even though our results had the same direction to the previous findings, they differ in terms of significance. It seems that there are other factors that might influence the height reporting accuracy beyond the knowledge about impending measurements. Possibly, participants in our study did not have an accurate knowledge of their current height. Their responses also suggest that they might not know their actual height since they do not measure it regularly. Descriptive statistics suggest that the majority of participants reported that they measure their height once a year or less (Table 6.2).

Further, based on previous research it was expected to find that females will be more accurate in height reporting than males (Imrhan et al., 1996). Our findings were not in the same direction as previous findings, and did not confirm higher height reporting accuracy among females than males. Results showed that females overestimated their height more than males; however this difference was not significant.

Consistent with previous research on height and weight reporting accuracy in the informed and uninformed groups (DeAndrea et al., 2012; Imrhan et al., 1996), no significant interactions between gender and knowledge were found for height and weight. The results suggest that the differences in accuracy between males and females were the same across the knowledge groups, and vice versa.

Lastly, prior research has shown that body dissatisfaction, eating disorder risk, social desirability, and frequency of measurements are related to the accuracy of self-reports of height and weight. Research supports that individuals who are dissatisfied with their bodies tend to underestimate their weight more than those who are not (e.g., Kurth & Ellert, 2010), those who exhibit disordered eating behaviours tend to overestimate their weight (e.g., Conley & Boardman, 2007), those with high scores on social desirability scales tend to underestimate their weight (e.g., Larson, 2000), and those who measure their weight frequently tend to be quite accurate reporters of their weight (e.g., Imrhan et al., 1996). These patterns of findings were not observed in the present study. It could be possible that these factors did not appear as significant in the present study due to the fact that the sample was too selective and homogeneous compared to some previous studies which recruited more representative samples. Further, these non-significant findings could be also explained by the fact that in the present study we did not conduct separate analyses for males and females. Some factors such as social desirability and disordered eating symptomatology have been found to predict significant inaccuracy in reporting among females and not males (Ambwani & Chmielewski, 2013). Lastly, the inability to find significant relations between the examined factors and the reporting errors could be potentially attributed to the weakness of some instruments, e.g., low reliability of the MCSD scale.

To our knowledge, this is the first study that examined the relation of the fear of negative evaluation with the accuracy of height and weight reporting. In general, individuals who score high on the fear of negative evaluation scale tend to exhibit distress over others' negative evaluations and try to avoid these evaluations (Leary, 1983). The results of the study support that participants who scored high on the fear of negative evaluation scale tended to underreport their weight to a lesser extent. Although, this effect was marginal. A potential explanation could be that participants who were concerned with negative evaluations may have considered the possibility that they will be measured in the study, and therefore they might decide to underestimate their weight to a lesser extent as a way to avoid any negative evaluation. Further, fear of negative evaluation has been linked with weight and shape concerns among adults (DeBoer et al., 2013). Alternatively, it could be possible that participants with high scores on the fear of negative evaluation scale have a better knowledge of their body weight; and therefore they underestimate their weight less since they may be more concerned about their weight.

One of the main strengths of the present study is the randomisation of participants to the informed and uninformed groups. This random allocation to experimental groups allowed an equal distribution of any random or systematic errors. In addition, the self-reports and actual measurements were conducted with no time difference; thus the reporting error in height and weight could not be attributed to any environmental or time factors. In regards to measurements, we followed the WHO standard for measurement and recording of height and weight (WHO, 1995). Height was measured to the nearest 0.1 cm and weight to the nearest 0.1 kg. Participants were measured with light clothing and without shoes. If any of the participants did not comply to the measurement guidelines they were excluded from the study. Thus, the differences between self-reported and measured height and weight could not be due to any measurement issues. Further, we considered the fact that the consumption of food before the measurements could influence the weight of participants, and therefore we arranged the appointments in the morning or at a minimum two hours after the lunch-time; nevertheless, due to the nature of the study we could not control the fact that some participants might have had a drink or a snack/ meal before the measurements. Lastly, we supplemented the traditional analysis which included multiple covariates, with heteroscedasticity-consistent standard errors that are robust to any violations of assumptions.

While the study has some noteworthy strengths, one important limitation of the study is the recruitment of a convenience sample. Most participants were Psychology students from two universities; hence the findings could not be generalised to all university students in Cyprus. In addition, the fact that the weight changes during the menstrual cycle in females could be taken into consideration, since any inaccuracy in weight self-reports in females could be attributed to this factor. Further, the time of day at which the actual measurements were collected may have differed from the time that participants typically measure their weight, and this may have an impact on the results.

Despite the limitations of the present study, the findings highlight the effectiveness of informing individuals that their height and weight would be measured in improving the accuracy of self-reports. The experimental manipulation used in the present study could be replicated with other samples, in terms of age and clinical diagnosis, to increase the generalisability of the findings. Future studies with more representative samples to test the effect of group allocation are needed, since university students appear to present excessive concerns about their bodies and weight (Kessler, 2004). These concerns were also found in our sample, as the majority of university students reported that they exercise, they are trying to avoid fatty foods and lose weight to a large extent. It could be interesting to expand the current experimental study with a range of age groups, including older adults, middle-aged and adolescents, where we might have expected to find larger errors and effects. Further research is also needed to examine the experimental manipulation in clinical groups, such as those with eating disorder symptomatology. It is known that individuals with eating disorders are concerned about their weight and shape, and appear to be quite accurate reporters of their self-reported height and weight. Extending the experimental manipulation with additional clinical groups, such as those with depressive and anxiety disorders is also useful. Due to their clinical diagnosis, these patients might not engage in physical activity, have poor eating habits, or avoid weighing themselves (Sahle et al., 2019). Therefore, it could be interesting to test the effect of group allocation in groups with particular characteristics and behaviours. Future studies could also expand the experimental manipulation with additional control variables, such as the BMI. Due to the small number of participants in some BMI categories, we could not include it in the present study. Lastly, future studies could also enhance the accuracy of self-reports of height and especially weight by informing participants that actual measurements could be obtained, perhaps selectively, after the self-reports. This simple and inexpensive method could improve the validity of epidemiological studies and national surveys by providing more accurate self-reports of height and weight in the examination of the prevalence of obesity or other health conditions in the population.

Chapter 7

General Discussion

The validity of self-reports of height and weight depends on the accuracy of these measurement procedures. How accurately respondents' self-reports describe their characteristics can be examined by measuring how closely their reports agree with the actual measurements of height and weight (Groves et al., 2004). Their answers on height and weight often appear to differ from the true value by some amount of reporting error. Inaccuracies could be attributed to forgetting or ignorance of current height and weight due to lack of recent measurement. Besides that, respondents may purposefully misreport their height and weight to minimise any socially undesirable characteristics and avoid negative impressions and embarrassment, or to maintain a favourable image in their own eyes.

A number of previous studies have investigated the accuracy of self-reports of height and weight and most of them suggested that height is generally overestimated and weight is underestimated (Gorber et al., 2007). Several determinants have been associated with less accurate self-reports of height and weight. However, some of the empirical findings are inconclusive and the factors that appear to influence self-reporting have been examined in isolation.

The present dissertation arose from a need to study the differences between self-reports and actual measurements of height and weight in a more consistent way and across different samples. This information is necessary to understand how different populations report their height and weight, identify the factors that influence the accuracy of these self-reports, and draw conclusions in regards to the consequences that inaccurate reporting may have on survey and epidemiological data, on the management of health conditions in clinical practice, as well as on policy making and decisions.

In addition to an introductory and the current concluding chapter, the dissertation consisted of five empirical studies, all of which examined the accuracy of self-reports of height and weight in general and clinical populations. Further, the influence of specific demographic, psychological, personality and behavioural factors on the differences between self-reports and measurements of height and weight has been investigated, integrating data from secondary analyses and an original experimental procedure. The results and implications from each study have been discussed in the respective chapters, and are briefly summarised below.

Main Findings of the Five Studies

The first study (Chapter 2) aimed to examine the accuracy of self-reported height and weight, and whether any inaccuracy was related to gender and age among a representative sample of Americans over the age of 50 and their partners of any age. Even though the sample was representative, due to design issues and missing values, some cases (more males and on average older than in the final sample) were excluded from the analyses. Participants included in the analyses were more likely to be younger than the excluded cases. Therefore, the generalisation of the findings to older Americans may be limited. The findings of the study provided evidence of the reporting of height and weight in older adults, and suggested that height was on average overestimated and weight was underestimated. These results are in correspondence with previous findings (Cawley et al., 2017; Gunnell et al., 2000; Kuczmarski et al., 2001). Older males overestimated their height more than older females, and older females underestimated their weight more than older males. Consistent with previous findings (Cawley et al., 2017), the overestimation of height was in general larger, and the underestimation of weight was less pronounced in the older groups of the HRS sample. The study also examined the reporting error in height and weight separately for the BMI and racial categories. The results suggest that individuals with higher BMI tend to be less accurate reporters of their height and weight. Whites appear to underestimate their weight more than other racial categories. The findings of the first study suggest that older adults are not very accurate reporters of their height and weight. These results could be useful for researchers and health professionals who decide to rely on self-reported data of height and weight on older adults. It is important to consider the reporting error that is associated with such data and the unreliable conclusions that can be derived from using self-reports particularly in high-stakes decision and monitoring of health indicators of a population with various health risks associated with ageing such as osteoporosis, diabetes and cardiovascular diseases (Gutzwiller et al., 2018).

The second study (Chapter 3) aimed to investigate the differences between self-reports and actual measurements of weight in a representative sample of Dutch individuals, whether factors such as gender, weight status, and age were related to these differences, and whether weight reporting accuracy changed after frequent measurements of weight. The results of the study suggested that participants provided inaccurate self-reports of their weight, by substantially underestimating it. These results are in correspondence with previous findings (Gil & Mora, 2011). No significant gender differences were found. This result could possibly explain the phenomenon that is prevalent in recent years and related to increased levels of body dissatisfaction in males. The findings also suggested that individuals with higher BMIs tended to misreport their weight more than those with lower BMIs, and agree with previous findings (Ambwani & Chmielewski, 2013; Gunnare et al., 2013). Further, it was supported that respondents reported their weight more accurately after frequent measurements of their weight. These findings are in line with previous studies (Gunnare et al., 2013; Imrhan et al., 1996). Contrary to the findings of Study 1 of this dissertation where old-old participants are more accurate reporters of weight than young-old, we found that Dutch males in Study 2 tended to underestimate their weight more as they get older. However, these results should be interpreted with caution due to the weak magnitude of the associations. These different findings add to the inconsistent results on weight reporting in older males and females that are available in the literature, and could be attributed to the different samples and methodologies of the two studies. It is important to note that the age range differs in these two studies. In the LISS sample, participants were on average middle-aged, while in the HRS sample, participants were predominantly older. Alternatively, the difference in findings among the two studies could be due to cultural differences (European vs. US sample), or due to the fact that the HRS data were collected a few years earlier than the LISS data (2006 vs. 2011). Overall, the second study suggested that there was an inaccuracy in the self-reports of weight which was more pronounced in individuals with higher BMIs and in older males. This inaccuracy appears to be reduced as respondents measure their weight in frequent intervals. Researchers should consider these results, and despite the cost of direct measurements, should collect them in order to have reliable results. Availability of modern technological tools, such as those implemented in LISS, that measure body weight and wirelessly send the information to the database, could facilitate cost-effective and accurate measurements of personal characteristics. Whenever actual measurements are difficult to record, researchers should instruct respondents to measure their weight by themselves before they are invited to report it. In general, individuals should self-monitor and take frequent measurements of their weight to increase self-awareness of eating and physical activity behaviours and outcomes.

The aim of the third study (Chapter 4) was to examine the accuracy of self-reported height and weight among adults with type 1 diabetes with and without disordered eating symptomatology. It also aimed to investigate whether the accuracy related to eating disorder pathology, gender, and perfectionism scores. This is the first study to examine the accuracy of self-reports of height and weight in adults with type 1 diabetes and disordered eating pathology. The findings of the study suggested that on average participants underestimated their height. The underestimation of height was in contrast to the findings of the other empirical studies of the dissertation, but it could be possibly explained by the fact that members of this particular group might remember their height from earlier years or might not be interested to present themselves as taller than they really were. Participants also underestimated their weight. The underestimation of weight is consistent with previous studies that examined the presence of diabetes and weight reporting (Jeffery, 1996; Yiannakoulia et al., 2006). Importantly, this finding was further supported by examining a selected sub-sample from the HRS general population who reported diabetes, which tended to underestimate their weight in a similar way to the clinical sample. To our knowledge, this is the first study that provides a comprehensive view of self-reporting of weight in adults with diabetes coming from general population and clinical samples. No significant group or gender differences were found on the accuracy of self-reports of height and weight. Lastly, there was some evidence that the scores on eating disorder symptomatology and perfectionism scales were related to the accuracy of weight reporting for some samples. Health professionals and researchers should be aware of these inaccuracies, as the use of reported data may result in misleading clinical practices and unreliable findings in a specialised population for which monitoring of weight status is crucial. In clinical practice, any inaccuracy in weight reporting, specifically, could have a detrimental impact on diabetes management, as patients' health condition and weight are highly interconnected (Bays et al., 2007). In research, any inaccuracy in height and weight measurements could lead to misleading estimates of obesity prevalence in this population and prevent the provision of treatment and management of diabetes.

The fourth study (Chapter 5) aimed to examine the differences between self-reports and measurements of height and weight, and whether any inaccuracy was related to eating disorder symptomatology and perfectionism scores among females who have been weight-recovered from anorexia nervosa. To our knowledge, this is the first study that examined the accuracy of self-reports in this population by considering measurement issues, such as the time difference between self-reports and actual measurements, that could potentially affect the differences in self-reports versus measured height and weight. The results of the study suggested that there were some differences between self-reports and measurements of height and weight, which agree with previous findings (Gorber et al, 2007; Wolfe et al., 2013); however both groups were relatively accurate reporters of their height and weight. In line with previous findings (Wolfe et al., 2013), females with a prior diagnosis of anorexia nervosa did not significantly differ from the healthy females in their self-reporting of height and weight. Non-significant correlations were found between the reporting error in height and weight and the scores on the eating disorder symptomatology measure for all subgroups. A significant positive correlation was only found between positive perfectionism and reporting error in weight in the control group. Although both two groups slightly misreported their height and weight, their BMIs were in the normal range, and their weight underreporting was smaller compared to more general community samples, researchers and clinicians should be cautious especially with individuals who have been weight-recovered from anorexia nervosa as they may exhibit residual concerns about their eating and weight.

The fifth study (Chapter 6) aimed to investigate the accuracy of self-reports of height and weight by manipulating the awareness of impending actual measurements after the self-reports in a sample of university students. Factors such as gender, body dissatisfaction, eating disorder risk, social desirability, fear of negative evaluation, frequency and recency of measurements that have been found in previous studies to be related to the accuracy of self-reports of height and weight were recorded and accounted for. This is the first study that examined whether the accuracy of self-reports of height and weight is influenced by the awareness of actual measurements controlling for these specific variables. Study participants were randomly allocated into two groups; those who were informed that actual measurements of height and weight would be taken after the self-reports and those who were not informed. Overall, the results of the study are consistent with the general trend (Gorber et al., 2007), suggesting that individuals tended to overestimate their height and underestimate their weight. Importantly, the informed participants were more accurate reporters of their weight compared to the uninformed participants. These results are in line with previous findings (Black et al., 1998; Imrhan et al., 1996). The two groups did not significantly differ in their height reporting error. The findings of the study suggest that the knowledge that actual measurements of weight will be obtained after the self-reports affects the weight reporting error. The psychological and personality factors examined were not significantly related to the reporting error, apart from the fear of negative evaluation, which was found to be positively related to the reporting error in weight.

The results of the study could be explained by the fact that individuals know their weight, but they choose not to report it accurately unless they are informed that actual measurements will be followed. It seems that university students are probably more aware of their body size since many of them reported that they engage in physical activity and are conscious of their diet by avoiding high-fat foods. It could be also that they have the opportunity to monitor their weight since most of them reported that they have a scale at home, or as they may have easy access to fitness facilities on university campuses. For height, it seems that individuals did not have an accurate knowledge of their own height since their opportunities to measure it are less frequent; hence no significant differences were found between the groups. In reality, it is not unexpected that individuals would have a better knowledge of their weight compared to height, as it is easier to measure with available equipment. Based on the current results, researchers could probably ensure the validity of their findings by informing participants that direct measurements could be obtained, perhaps selectively, after the self-reports.

Taken together, the findings of the present studies support that self-reported measures of height and weight contain substantial reporting error in the different samples and contexts being examined. In general, weight was on average underestimated, while height was overestimated. One exception was the sample of adults with type 1 diabetes. Findings from these studies are broadly consistent with the empirical research on the nature of reporting error in height and weight (see Gorber et al., 2007 for a systematic review). The findings further suggest that gender, age, weight status, frequency of weight measurements, and awareness of impending actual measurements, appear to have an influence on the reporting error in height and weight.

Comparison of Studies

A comparison of the findings from Study 1 and Study 2 demonstrated slight differences on the reporting error in weight between the two general population samples. On average, the LISS sample underestimated weight by 1.61 kg, while the HRS sample by 1.41 kg. Overall, it seems that the general population samples tend to underestimate their weight; any differences could be attributed to the different modes of recording self-reports in the two studies. In the HRS, face-to-face interviews were conducted to collect information about participants' height and weight, while in the LISS participants self-reported their weight via an online questionnaire. It could be possible that self-reports of weight collected in face-to-face interviews are more accurate as respondents may believe that the interviewer might be able to roughly detect a dishonest response compared to self-reports of weight collected via phone or online (Burke & Carman, 2016). Differences between the two studies could be also explained by the different time periods of data collection, the fact that self-reports and actual measurements were collected with a time difference in the LISS, or due to the different cultural contexts.

Further, a comparison of the results from Study 1 and Study 5, might suggest generational differences on the accuracy of self-reports of weight. On average, the HRS sample exhibited greater discrepancies between self-reports and measurements of weight compared to university students (by -1.41 kg or -1.29 kg vs. -0.54 kg). While the literature on body image supports that body dissatisfaction remains relatively stable across the life span (Webster & Tiggemann, 2003), older adults appear to have less anxiety about their appearance and a lower drive for thinness (Lewis & Cachelin, 2001; Tiggemann & Lynch, 2001). Moreover, body dissatisfaction is mostly related to body functioning rather than their appearance (Tiggemann, 2004). In contrast, young adults tend to exhibit concerns about their body shape and weight, through exposure to media images and peer influences (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). Due to these body image differences across age, it would be more likely for young adults to constantly monitor their weight. It then plausible that awareness of body weight led university students to self-report their weight with less error compared to older adults.

A comparison of the results from Studies 1 and 2 with those from Studies 3 and 4 suggests that weight underreporting is generally larger in the general population samples compared to the clinical samples employed in these studies. It could be concluded that individuals' concerns about their body weight and shape due to their clinical diagnosis (diabetes and weight restoration in anorexia nervosa), may make them more aware of their body weight.

Regarding height reporting, a comparison of the findings from Study 1 and Study 5 suggests no noticeable differences between the two samples. On average, both samples appear to overestimate height in a similar way (by 2.11 cm vs. 2.17 cm). The overreporting of height appears to be slightly larger in the HRS sample that consists of older adults over the age of 60 (by 2.41 cm). The lack of knowledge of their current height might lead both samples to misreport it to a similar extent.

Lastly, it appears that the reporting of height is slightly different in the clinical samples compared to the general population and university student samples. While the overestimation of height is similar in the HRS US sample and the sample of Cypriot university students, the height reporting was either underestimated (by -1.24 cm) among individuals with type 1 diabetes with or without eating disorder pathology, or slightly overestimated (by 0.13 cm) among females who have been weight-restored from anorexia nervosa. These results could be possibly explained by the fact that participants with type 1 diabetes may not be interested to present themselves as taller than they really are or they might remember their height from earlier years. Females who have been weight-restored from anorexia nervosa are quite accurate reporters of their height possibly due to the fact that as part of their previous anorexia nervosa diagnosis they have been measured during doctor visits and thus are likely to be aware of their height.

Theoretical and Clinical Implications

Based on these findings, researchers and health professionals who rely on self-reported measures of height and weight to draw conclusions on the prevalence of health conditions associated with weight and/ or BMI, to monitor their patients' status and take therapeutic decisions, or for policy-making decisions on reducing obesity rates for instance, need to consider how accurate and reliable such data are. One can say that the differences between self-reports and direct measurements of height and weight are not meaningful, and it is not realistic to expect that self-reports and measurements will be perfectly matched. However, the current findings support that these differences are systematic and significant, of small, medium and occasionally large effect sizes, and should be taken into consideration. Based on the nature of the samples that were examined, the discrepancies between self-reports and measurements of height and weight are evident for many individuals. Even though there were major or minor discrepancies, the misreporting is there and cannot be ignored.

For those working with self-report measures of height and weight, it is important to consider the extent of the reporting error in males and females, in younger and older adults, in overweight and obese individuals, in adults with diabetes or in those with a prior diagnosis of anorexia nervosa. Approaches such as guiding individuals to measure their weight prior to self-reports, or informing them that direct measurements may follow after self-reports, not as a form of 'deception', but by collecting measurements from a random sub-sample of respondents, could reduce error in self-reported data. Alternatively, if feasible, self-report measures could be replaced by direct measurements of height and weight. Although, it is important to consider that the collection of actual measurements is not a panacea, as apart from the financial and practical constraints, these measurements may be vulnerable to measurement error as well (Chernenko, Meeks, & Smith, 2019). In any case, those working with self-reported measures of height and weight should be encouraged to consider the inaccuracy inherent to such data and act accordingly. Whenever possible, it is highly recommended to consider collecting actual measurements of height and weight.

The findings of the present dissertation have important implications for the field of clinical psychology. Clinical psychologists encounter individuals with weight and shape concerns and disordered eating behaviours, eating disorders, as well as remitted or recovered individuals. It is necessary to complete a thorough assessment of an individual, including a detailed history of eating behaviours to identify those at risk, those with an active eating disorder, or remitted individuals. The results of Study 4 suggest that females who have been weight-restored from anorexia nervosa overestimate their height and underestimate their weight, similar to healthy controls. Firstly, it is encouraging that their self-reporting agrees with the fact that they are considered as remitted or recovered individuals. Even though females with a prior diagnosis of anorexia nervosa tend to behave as healthy females and their BMIs are in the normal range, they may still have residual concerns about their eating, body shape and weight after their treatment. The findings of the study also suggest that females who have been weight-restored from anorexia nervosa have greater levels of eating disorder symptomatology as they scored higher on the EDE-Q compared to the healthy controls. It is therefore important for clinical psychologists not to be misled by the similarity of individuals who have been weight-restored form anorexia nervosa with the healthy individuals. They should consider that anorexia nervosa is a complex and serious condition with a high risk of relapse, and must carefully monitor individuals who have been weight-restored from anorexia nervosa to prevent relapse.

As found in Studies 1 and 2, underweight individuals appear to overestimate their weight. This inaccuracy may be indicative of their need to hide their low weights from others, or due to the distorted body image they have, by believing that they are heavier than they really are (Conley & Boardman, 2007; Larson, 2000). In regards to overweight/ obese individuals, the findings of the studies suggest that they underestimate their weight. This inaccuracy may reflect body dissatisfaction and their desire to appear thinner than they really are, influenced by societal norms (Goldfield et al., 2010; Larson, 2000). It is necessary for clinical psychologists to figure out what drives individuals' inaccurate reporting of weight, and how these individuals perceive their body shape/ weight, to assess their attitudes and behaviours towards their bodies, as well as any other associated conditions such as depression, anxiety and low self-esteem.

Clinical psychologists should also consider the findings related to non-clinical samples. In general, the results suggest that individuals tend to on average overestimate their height and underestimate their weight. The reliance on self-reported height and weight may provide a misleading representation of the health status of these individuals and may overshadow any other problems. Special consideration is also necessary for older adults when assessing and monitoring health in this population.

The present findings also have important implications for survey research. Self-report measures are most commonly used to gather information and despite their advantages, they also contain a number of weaknesses. Researchers and psychologists are often concerned about whether respondents answer the questions truthfully (Tourangeau & Yan, 2007). Respondents are likely to be less accurate on measures assessing psychological or personality constructs, measures on drug use, or even on questionnaires about less sensitive topics such as physical activity and caffeine consumption. The degree of misreporting appears to vary with the topic of the questionnaire, with respondents underreporting or overreporting certain behaviours or characteristics (Tourangeau & Yan, 2007). Demographic, such as gender and age, or other variables appear to affect the accuracy of self-reports (Crockett et al., 1987; Preisendörfer & Wolter, 2014). The results of the dissertation indicate that those who work with self-report measures should consider the effect of respondents' characteristics on the accuracy of self-report measures, which are often systematic. Further, it is strongly recommended that researchers and psychologists should encourage respondents to take objective measurements, wherever possible, prior to self-reports. Apart from height and weight, respondents can objectively measure their physical activity using accelerometers, or monitor their blood pressure or glucose by themselves prior to the survey or interview. They could also use the strategy of informing respondents that objective measures may follow after the self-reports, in such a way as to improve the accuracy of self-reported data.

Concluding Comments

Without question, further research is needed on the accuracy of self-reports of height and weight. Having identified potential factors, future research can enter these and other sources of error into models that would be applied to adjust self-reported data in various contexts, including epidemiological studies and research to inform policy making, for more accurate conclusions. Further, our results showed that the information about impending actual measurements lead to more accurate and reliable self-reported data. It could be useful to apply this approach to other populations, such as in other age groups, and in clinical samples, e.g., individuals with eating disorder symptomatology and depressive and anxiety disorders, to examine effects in samples where reporting errors may be larger.

Overall, the current dissertation provided evidence on the accuracy of self-reports of height and weight on different populations, across contexts and using original or secondary data. Despite limitations in each individual study that were described in previous chapters (sample selection, sample size, measurement procedures, time period of data collection), the diverse data sources, samples, and design approaches, allowed for a multi-layered and integrated treatment of the research topic. Identifying reasons of misreporting were suggested, including gender, age, weight status, and frequency of weight measurements. Approaches that could reduce the reporting error in self-reported data were also suggested, including guiding individuals to measure their weight prior to self-reports and informing them that actual measurements may follow after the self-reports. The present findings have important implications for researchers and health professionals who work with self-reports of height and weight. Further, the findings of this dissertation could be applied to survey research and psychological measurement procedures in general. Such information will be useful to researchers and health professionals for appropriate health planning and decisions.

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Appendices

Appendix A. Model results for predicting the reporting error in height and age in HRS

The hierarchical multiple regression for the overall sample revealed that at Model 1, age contributed significantly to the regression model, $F(1, 6259) = 203.27$, $p < .001$, and accounted for 3.1% of the variation in the reporting error in height. The non-linear addition to the regression model was significant, $F(1, 6258) = 9.18$, $p = .002$. Adding the Model 2, which was linear and quadratic combined, accounted for 3.3% of the variation in the reporting error in height and the total R-squared was significant, $F(2, 6258) = 106.36$, $p < .001$.

The hierarchical multiple regression for the male sample revealed that at Model 1, age contributed significantly to the regression model, $F(1, 2468) = 78.68$, $p < .001$, and accounted for 3.1% of the variation in the reporting error in height. The non-linear addition to the regression model was non-significant, $F(1, 2467) = 2.89$, $p = .09$. Adding the Model 2, which was linear and quadratic combined, accounted for 3.2% of the variation in the reporting error in height and the total R-squared was significant, $F(2, 2467) = 40.81$, $p < .001$.

The hierarchical multiple regression for the female sample revealed that at Model 1, age contributed significantly to the regression model, $F(1, 3789) = 119.12$, $p < .001$, and accounted for 3% of the variation in the reporting error in height. The non-linear addition to the regression model was significant, $F(1, 3788) = 9.35$, $p = .002$. Adding the Model 2, which was linear and quadratic combined, accounted for 3.3% of the variation in the reporting error in height and the total R-squared was significant, $F(2, 3788) = 64.37$, $p < .001$.

Appendix B. Model results for predicting the reporting error in height and age (excluding outliers) in HRS

The hierarchical multiple regression for the overall sample excluding outliers revealed that at Model 1, age contributed significantly to the regression model, $F(1, 6171) = 346.90$, $p < .001$, and accounted for 5.3% of the variation in the reporting error in height. The non-linear addition to the regression model was significant, $F(1, 6170) = 8.73$, $p = .003$. Adding the Model 2, which was linear and quadratic combined, accounted for 5.5% of the variation in the reporting error in height and the total R-squared was significant, $F(2, 6170) = 178.03$, $p < .001$.

The hierarchical multiple regression for the male sample excluding outliers revealed that at Model 1, age contributed significantly to the regression model, $F(1, 2430) = 129.30$, $p < .001$, and accounted for 5.1% of the variation in reporting error in height. The non-linear addition to the regression model was not significant, $F(1, 2429) = .09$, $p = .76$. Adding the Model 2, which was linear and quadratic combined, accounted for 5.1% of the variation in the reporting error in height and the total R-squared was significant, $F(2, 2429) = 64.67$, $p < .001$.

The hierarchical multiple regression for the female sample excluding outliers revealed that at Model 1, age contributed significantly to the regression model, $F(1, 3739) = 209.15$, $p < .001$, and accounted for 5.3% of the variation in the reporting error in height. The non-linear addition to the regression model was significant, $F(1, 3738) = 18.88$, $p < .001$. Adding the Model 2, which was linear and quadratic combined, accounted for 5.8% of the variation in the reporting error in height and the total R-squared was significant, $F(2, 3738) = 114.52$, $p < .001$.

Appendix C. Model results for predicting the reporting error in weight and age in HRS

The hierarchical multiple regression for the overall sample revealed that at Model 1, age contributed significantly to the regression model, $F(1, 6303) = 29.16$, $p < .001$, and accounted for 0.5% of the variation in the reporting error in weight. The non-linear addition to the regression model was non-significant, $F(1, 6302) = 2.15$, $p = .14$. Adding the Model 2, which was linear and quadratic combined, accounted for 0.5% of the variation in the reporting error in weight and the total R-squared was significant, $F(2, 6302) = 15.65$, $p < .001$.

The hierarchical multiple regression for the male sample revealed that at Model 1, age contributed significantly to the regression model, $F(1, 2500) = 7.87$, $p = .005$, and accounted for 0.3% of the variation in the reporting error in weight. The non-linear addition to the regression model was non-significant, $F(1, 2499) = .95$, $p = .33$. Adding the Model 2, which was linear and quadratic combined, accounted for 0.4% of the variation in the reporting error in weight and the total R-squared was significant, $F(2, 2499) = 4.41$, $p = .01$.

The hierarchical multiple regression for the female sample revealed that at Model 1, age contributed significantly to the regression model, $F(1, 3801) = 22.03$, $p < .001$, and accounted for 0.6% of the variation in the reporting error in weight. The non-linear addition to the regression model was non-significant, $F(1, 3800) = 1.84$, $p = .18$. Adding the Model 2, which was linear and quadratic combined, accounted for 0.6% of the variation in the reporting error in weight and the total R-squared was significant, $F(2, 3800) = 11.94$, $p < .001$.

Appendix D. Model results for predicting the reporting error in weight and age (excluding outliers) in HRS

The hierarchical multiple regression for the overall sample excluding outliers revealed that at Model 1, age contributed significantly to the regression model, $F(1, 6196) = 88.87$, $p < .001$, and accounted for 1.4% of the variation in the reporting error in weight. The non-linear addition to the regression model was significant, $F(1, 6195) = 9.32$, $p = .002$. Adding the Model 2, which was linear and quadratic combined, accounted for 1.6% of the variation in the reporting error in weight and the total *R*-squared was significant, $F(2, 6195) = 49.15$, $p < .001$.

The hierarchical multiple regression for the male sample excluding outliers revealed that at Model 1, age contributed significantly to the regression model, $F(1, 2454) = 19.94$, $p < .001$, and accounted for 0.8% of the variation in the reporting error in weight. The non-linear addition to the regression model was significant, $F(1, 2453) = 4.58$, $p = .03$. Adding the Model 2, which was linear and quadratic combined, accounted for 1% of the variation in the reporting error in weight and the total *R*-squared was significant, $F(2, 2453) = 12.27$, $p < .001$

The hierarchical multiple regression for the female sample excluding outliers revealed that at Model 1, age contributed significantly to the regression model, $F(1, 3740) = 70.96$, $p < .001$, and accounted for 1.9% of the variation in the reporting error in weight. The non-linear addition to the regression model was significant $F(1, 3739) = 7.67$, $p = .006$ Adding the Model 2, which was linear and quadratic combined, accounted for 2.1% of the variation in the reporting error in weight and the total *R*-squared was significant, $F(2, 3739) = 39.38$, $p < .001$.

Appendix E. Model results for predicting the reporting error for weight and BMI in LISS

The hierarchical multiple regression for the overall sample revealed that at Model 1, BMI contributed significantly to the regression model, $F(1, 363) = 58.14$, $p < .001$ and accounted for 13.8% of the variation in the reporting error in weight. The non-linear addition to the regression model was statistically significant, $F(1, 362) = 4.40$, $p = .04$. Adding the Model 2, which was linear and quadratic combined, accounted for 14.8% of the variation in the reporting error in weight and the total R-squared was significant, $F(2, 362) = 31.54$, $p < .001$.

The hierarchical multiple regression for the overall sample (excluding the 4 outliers) revealed that at Model 1, BMI contributed significantly to the regression model, $F(1, 359) = 43.94$, $p < .001$, and accounted for 10.9% of the variation in the reporting error in weight. The non-linear addition to the regression model was non-significant, $F(1, 358) = 0.06$, $p > .05$. The Model 2 accounted for 10.9% of the variation in the reporting error in weight and the total R-squared was significant, $F(2, 358) = 21.94$, $p < .001$.

The hierarchical multiple regression for the male sample revealed that at Model 1, BMI contributed significantly to the regression model, $F(1, 181) = 16.75$, $p < .001$ and accounted for 8.5% of the variation in the reporting error in weight. The non-linear addition to the regression model was non-significant, $F(1,180) = 0.09$, $p > .05$. The Model 2 accounted for 8.5% of the variation in the reporting error in weight and the total R-squared was significant, $F(2, 180) = 8.38$, $p < .001$.

Lastly, the hierarchical multiple regression for the female sample (excluding the 4 outliers) revealed that at Model 1, BMI contributed significantly to the regression model, $F(1, 176) = 28.59$, $p < .001$, and accounted for 14% of the variation in the reporting error in weight. The non-linear addition to the regression model was non-significant, $F(1, 175) = 0.05$, $p > .05$. The Model 2 accounted for 14% of the variation in the reporting error in weight and the total R-squared was significant, $F(2, 175) = 14.24$, $p < .001$.

Appendix F. Model results for predicting the reporting error for weight and age in LISS

The hierarchical multiple regression for the overall sample revealed that at Model 1, age did not contribute significantly to the regression model, $F(1, 363) = 0.77$, $p > .05$ and accounted for 0.2% of the variation in the reporting error in weight. The non-linear addition to the regression model was non-significant, $F(1, 362) = 0.55$, $p > .05$. Adding the Model 2, which was linear and quadratic combined, accounted for 0.4% of the variation in the reporting error in weight and the total R-squared was non-significant, $F(2, 362) = 0.66$, $p > .05$.

The hierarchical multiple regression for the overall sample (excluding the 4 outliers) revealed that at Model 1, age contributed significantly to the regression model, $F(1, 359) = 4.46$, $p < .05$, and accounted for 1.2% of the variation in the reporting error in weight. The non-linear addition to the model was non-significant, $F(1, 358) = 0.07$, $p > .05$. The Model 2 accounted for 1.2% of the variation in the reporting error in weight and the total R-squared was non-significant, $F(2, 358) = 2.26$, $p > .05$.

The hierarchical multiple regression for the male sample revealed that at Model 1, age contributed significantly to the regression model, $F(1, 181) = 5.20$, $p < .05$ and accounted for 2.8% of the variation in the reporting error in weight. The non-linear addition to the model was non-significant, $F(1,180) = 0.08$, $p > .05$. The Model 2 accounted for 2.8% of the variation in the reporting error in weight and the total R-squared was non-significant, $F(2, 180) = 2.62$, $p > .05$.

Finally, the hierarchical multiple regression for the female sample (excluding the 4 outliers) revealed that at Model 1, age did not contribute significantly to the regression model, $F(1, 176) = 0.40$, $p > .05$, and accounted for 0.2% of the variation in the reporting error in weight. The non-linear addition to the model was non-significant, $F(1, 175) = 0.03$, $p > .05$. The Model 2 accounted for 0.2% of the variation in the reporting error in weight and the total R-squared was non-significant, $F(2, 175) = 0.22$, $p > .05$.

Appendix G. Model results for predicting the reporting error for weight and age at T2 in LISS

The hierarchical multiple regression for the overall sample revealed that at Model 1, age did not contribute significantly to the regression model, $F(1, 253) = 3.60$, $p > .05$ and accounted for 1.4% of the variation in the reporting error in weight. The non-linear addition to the model was non-significant, $F(1, 252) = 0.97$, $p > .05$. Adding the Model 2, which was linear and quadratic combined, accounted for 1.8% of the variation in the reporting error in weight and the total R-squared was non-significant, $F(2, 252) = 2.29$, $p > .05$.

The hierarchical multiple regression for the male sample revealed that at Model 1, age did not contribute significantly to the regression model, $F(1, 125) = 0.25$, $p > .05$ and accounted for 0.2% of the variation in the reporting error in weight. The non-linear addition to the model was non-significant, $F(1, 124) = 0.19$, $p > .05$. Adding the Model 2, accounted for 0.4% of the variation in the reporting error in weight and the total R-squared was non-significant, $F(2, 124) = 0.22$, $p > .05$.

The hierarchical multiple regression for the female sample revealed that at Model 1, age contributed significantly to the regression model, $F(1, 126) = 3.999$, $p = .05$ and accounted for 3.1% of the variation in the reporting error in weight. The non-linear addition to the model was non-significant, $F(1, 125) = 0.39$, $p > .05$. Adding the Model 2, accounted for 3.4% of the variation in the reporting error in weight and the total R-squared was non-significant, $F(2, 125) = 2.19$, $p > .05$.

The analysis was repeated excluding the 6 outliers. The hierarchical multiple regression for the overall sample (excluding outliers) revealed that at Model 1, age contributed significantly to the regression model, $F(1, 247) = 5.23$, $p < .05$ and accounted for 2.1% of the variation in the reporting error in weight. The non-linear addition to the model was non-significant, $F(1, 246) = 0.93$, $p > .05$. Adding the Model 2, accounted for 2.4% of the variation in the reporting error in weight and the total R-squared was significant, $F(2, 246) = 3.08$, $p =.05$.

The hierarchical multiple regression for the male sample (excluding outliers) revealed that at Model 1, age did not contribute significantly to the regression model, $F(1, 124) = 1.52$, $p > .05$ and accounted for 1.2% of the variation in the reporting error in weight. The non-linear addition to the model was non-significant, $F(1, 123) = 0.23$, $p > .05$. Adding the Model 2, accounted for 1.4% of the variation in the reporting error in weight and the total R-squared was non-significant, $F(2, 123) = 0.87$, $p > .05$.

The hierarchical multiple regression for the female sample (excluding outliers) revealed that at Model 1, age contributed significantly to the regression model, $F(1, 121) = 4.18$, $p < .05$ and accounted for 3.3% of the variation in the reporting error in weight. The non-linear addition to the model was non-significant, $F(1, 120) = 0.51$, $p > .05$. Adding the Model 2, accounted for 3.7% of the variation in the reporting error in weight and the total *R*-squared was non-significant, $F(2, 120) = 2.33$, $p > .05$.

Appendix H. Power analysis for Study 5

Below a number of post-hoc power analyses using data from published studies are presented:

A power analysis was performed for sample size estimation, based on data from Black and colleagues' (1998) study (*N* = 223), comparing absolute difference weight in the informed and uninformed groups. The effect size (*d*) was not reported in the study, and it was calculated by the researcher as *d* = 0.40, and considered to be medium using Cohen's (1992) criteria. With an alpha = .05 and power = .80, the sample size needed with this effect size is *N* = 156 (78 participants per group) for the group comparison (GPower 3.1.3).

DeAndrea et al., (2012) in their third study compared BMI and weight discrepancies in the informed and uninformed groups. For BMI discrepancies, the effect size was 0.50, considered to be medium. With an alpha = .05 and power = .80, the sample size needed with this effect is *N* = 102 (51 participants per group) for the group comparison. For weight discrepancies, the effect size was 0.58, considered to be medium. With an alpha = .05 and power = .80, the sample size needed with this effect size is *N* = 76 (38 participants per group) for group comparison.

Imrhan et al., (1996) compared the accuracy of weight self-reports in the informed and uninformed groups. For mean absolute error of estimation for weight, the effect size was 0.48 for males and 0.52 for females, considered to be medium effect sizes. With an alpha = .05 and power = .80, the sample size needed is *N* = 110 males (55 per group) and *N* = 94 females (47 per group).

Black and colleagues (1998) examined the accuracy across the weight range for the informed and uninformed groups. The effect size for this analysis was 0.37, considered to be moderate-to-small. With an alpha = .05 and power = .80, the sample size needed is *N* = 184 (92 participants per group).

DeAndrea and colleagues (2012) examined whether there was an effect on the BMI discrepancy due to an interaction between participants' gender and awareness. The *f* effect size for the interaction was 0.27, considered to be medium. The sample size needed is *N* = 156.

Present study. Given the variability in effect sizes from the studies listed above, a sample size of *N* = 184 was considered as a minimum sample size for examining the main hypothesis of the study, in its simple form, which is the comparison of the informed and uninformed groups. However, in our design group comparisons would be carried out after controlling for other variables (covariates) with unknown contributions, through more advanced statistical tests. Hence, we decided to increase the sample size further.

Appendix I. Measures of Study 5

PN: ....

Παρακαλώ απαντήστε στις παρακάτω ερωτήσεις. Το ερωτηματολόγιο είναι *αυστηρά ανώνυμο* και οι απαντήσεις που θα δώσετε είναι *εμπιστευτικές*. Απαντήστε τις ερωτήσεις που ακολουθούν συμπληρώνοντας ή επιλέγοντας την απάντηση που σας αντιπροσωπεύει καλύτερα.

Δημογραφικές Πληροφορίες
Πανεπιστήμιο:
Τμήμα:
Έτος σπουδών:
☐ Προπτυχιακός ☐ Μεταπτυχιακός
Φύλο: α) Άντρας β) Γυναίκα
Ηλικία:
Εθνικότητα/ υπηκοότητα:
Πώς θα περιέγραφες τον εαυτό σου την παρούσα στιγμή; α) Λιποβαρή β) Κανονικού Βάρους γ) Υπέρβαρο δ) Παχύσαρκο
Αντιμετωπίζεις ή αντιμετώπισες στο παρελθόν οποιοδήποτε πρόβλημα υγείας; α) Ναι β) Όχι Εάν ναι, ποια ήταν η διάγνωση;
Αντιμετωπίζεις ή αντιμετώπισες στο παρελθόν οποιοδήποτε πρόβλημα με το βάρος/ διατροφή σου; α) Ναι β) Όχι Εάν ναι, δώσε περισσότερες πληροφορίες.
Τι κάνεις αυτόν τον καιρό για το βάρος σου; α) Προσπαθώ να χάσω βάρος β) Προσπαθώ να βάλω βάρος γ) Προσπαθώ να παραμείνω στο ίδιο βάρος δ) Δεν προσπαθώ να κάνω τίποτα για το βάρος μου
Αυτόν τον καιρό κάνεις δίαιτα για να χάσεις βάρος; α) Ναι β) Όχι
Προσπαθείς να χάσεις βάρος με άλλους τρόπους (π.χ. χάπια, διουρητικά); α) Ναι β) Όχι
Αυτόν τον καιρό γυμνάζεσαι; α) Ναι β) Όχι

Εάν ναι, πόσες φορές τη βδομάδα γυμνάζεσαι; α) 1 - 2 β) 3 - 4 γ) 5 - 7 δ) 7+ Συνήθως για πόση ώρα γυμνάζεσαι κάθε φορά;
Ακολουθείς κάποια συγκεκριμένη διατροφή (π.χ. χορτοφαγική);
Κατά μέσο όρο, πόσα φρούτα καταναλώνεις καθημερινά;
Κατά μέσο όρο, πόσα λαχανικά καταναλώνεις καθημερινά;
Προσπαθείς να αποφεύγεις τις τροφές που περιέχουν λιπαρά; α) Ναι β) Όχι
Πότε ήταν το τελευταίο γεύμα/ ποτό που κατανάλωσες σήμερα;
Πόσο συχνά ζυγίζεσαι; α) Ποτέ β) Μία φορά το χρόνο ή λιγότερο γ) Κάθε δύο μήνες δ) Μία φορά τον μήνα ε) Κάθε δύο βδομάδες στ) Μία φορά τη βδομάδα ζ) Καθημερινώς η) Περισσότερο από μία φορά την ημέρα
Πότε ήταν η τελευταία φορά που ζυγίστηκες;
Έχεις ζυγαριά στο σπίτι; α) Ναι β) Όχι
Πόσο συχνά μετράς το ύψος σου; α) Ποτέ β) Μία φορά το χρόνο ή λιγότερο γ) Κάθε δύο μήνες δ) Μία φορά τον μήνα ε) Κάθε δύο βδομάδες στ) Μία φορά τη βδομάδα ζ) Καθημερινώς η) Περισσότερο από μία φορά την ημέρα
Πότε ήταν η τελευταία φορά που μέτρησες το ύψος σου;

Body Areas Satisfaction Subscale (BASS)

Χρησιμοποιήστε την πιο κάτω κλίμακα 1 έως 5 για να δείξετε πόσο δυσαρεστημένος/η ή ικανοποιημένος/η είστε με κάθε ένα από τα ακόλουθα μέρη του σώματός σας:

1 = Πολύ Δυσαρεστημένος/η

2 = Δυσαρεστημένος/η

3 = Ούτε Δυσαρεστημένος/η Ούτε Ικανοποιημένος/η

4 = Ικανοποιημένος/η

5 = Πολύ Ικανοποιημένος/η

1. Πρόσωπο (χαρακτηριστικά, χρώμα δέρματος) ----------

2. Μαλλιά (χρώμα, πάχος, υφή) ----------

3. Κάτω μέρος (γλουτοί, γοφοί, μηροί, πόδια) ----------

4. Μέση (μέση, στομάχι) ----------

5. Πάνω μέρος (στήθος, ώμοι, χέρια) ----------

6. Μυϊκός τόνος/μάζα ----------

7. Βάρος ----------

8. Ύψος ----------

9. Συνολική εμφάνιση ----------

Eating Attitudes Test (EAT-26)
Παρακαλώ απαντήστε τις πιο κάτω ερωτήσεις κυκλώνοντας την απάντηση που σας αντιπροσωπεύει καλύτερα, ανάλογα με το πόσο συχνά σας συμβαίνει αυτό που περιγράφει η πρόταση.

	Πάντα	Πολύ Συχνά	Συχνά	Κάποτε	Σπάνια	Ποτέ
1. Τρομάζω μόνο με την ιδέα να είμαι υπέρβαρος/η	1	2	3	4	5	6
2. Αποφεύγω να τρώω όταν πεινάω	1	2	3	4	5	6
3. Πιάνω τον εαυτό μου να με απασχολεί συχνά το θέμα φαγητό	1	2	3	4	5	6
4. Έχω επεισόδια ανεξέλεγκτης κατανάλωσης φαγητού σε μικρό χρονικό διάστημα κατά τα οποία νιώθω ότι δεν μπορώ να σταματήσω να τρώω	1	2	3	4	5	6
5. Κόβω το φαγητό μου σε μικρά κομματάκια	1	2	3	4	5	6
6. Με απασχολεί πόσες θερμίδες έχουν τα φαγητά που τρώω	1	2	3	4	5	6
7. Αποφεύγω ιδιαίτερα τα φαγητά που είναι πλούσια σε υδατάνθρακες (δηλαδή ψωμί, ρύζι, πατάτες, κλπ.)	1	2	3	4	5	6
8. Νιώθω ότι οι γύρω μου θα προτιμούσαν να έτρωγα περισσότερο	1	2	3	4	5	6
9. Κάνω εσκεμμένα εμετό μετά που τρώω	1	2	3	4	5	6
10. Νιώθω πολλές ενοχές μετά που τρώω	1	2	3	4	5	6
11. Με απασχολεί συχνά η επιθυμία να είμαι πιο αδύνατος/η	1	2	3	4	5	6
12. Υπολογίζω τις θερμίδες που καίω όταν γυμνάζομαι	1	2	3	4	5	6
13. Οι άλλοι πιστεύουν ότι είμαι πολύ αδύνατος/η	1	2	3	4	5	6
14. Με απασχολεί η σκέψη ότι έχω λίπος στο σώμα μου	1	2	3	4	5	6
15. Ξοδεύω περισσότερη ώρα σε σχέση με άλλους για να φάω το γεύμα μου	1	2	3	4	5	6
16. Αποφεύγω τα τρόφιμα με ζάχαρη	1	2	3	4	5	6
17. Τρώω προϊόντα δίαιτας	1	2	3	4	5	6
18. Νιώθω ότι το θέμα φαγητό ελέγχει τη ζωή μου	1	2	3	4	5	6
19. Δείχνω αυτοέλεγχο όταν είμαι γύρω από φαγητό	1	2	3	4	5	6
20. Νιώθω ότι οι άλλοι με πιέζουν για να φάω	1	2	3	4	5	6
21. Αφιερώνω αρκετό χρόνο και πολλή σκέψη για το θέμα φαγητό	1	2	3	4	5	6
22. Νιώθω άσχημα όταν φάω γλυκά ή προϊόντα με ζάχαρη	1	2	3	4	5	6
23. Καταπιάνομαι με διαιτητική συμπεριφορά	1	2	3	4	5	6
24. Μου αρέσει να νιώθω το στομάχι μου άδειο	1	2	3	4	5	6
25. Έχω την τάση να προκαλώ εμετό μετά που τρώω	1	2	3	4	5	6
26. Μου αρέσει να δοκιμάζω καινούρια και πλούσια φαγητά	1	2	3	4	5	6

Weight Concerns Scale (WCS)

Για όλες τις παρακάτω ερωτήσεις, κυκλώστε μόνο έναν αριθμό.

1. Πόσο περισσότερο ή λιγότερο αισθάνεσαι να ανησυχείς για το βάρος σου και το σχήμα του σώματος σου σε σχέση με άλλα άτομα της ηλικίας σου;

1. Ανησυχώ πολύ λιγότερο από ότι άλλα άτομα.
2. Ανησυχώ λίγο λιγότερο από ότι άλλα άτομα.
3. Ανησυχώ περίπου το ίδιο με άλλα άτομα.
4. Ανησυχώ λίγο περισσότερο από ότι άλλα άτομα.
5. Ανησυχώ πολύ περισσότερο από ότι άλλα άτομα.

2. Πόσο φοβάσαι να αποκτήσεις 1.5 κιλά;

(1)	(2)	(3)	(4)	(5)
Δεν Φοβάμαι	Φοβάμαι Λίγο	Φοβάμαι Μέτρια	Φοβάμαι Πολύ	Τρομάζω

3. Πότε ήταν η τελευταία φορά που ξεκίνησες δίαιτα;

1. Δεν έχω κάνει ποτέ δίαιτα.
2. Ήμουν σε δίαιτα περίπου πριν ένα χρόνο.
3. Ήμουν σε δίαιτα περίπου πριν 6 μήνες.
4. Ήμουν σε δίαιτα περίπου πριν 3 μήνες.
5. Ήμουν σε δίαιτα περίπου πριν 1 μήνα.
6. Ήμουν σε δίαιτα λιγότερο από πριν 1 μήνα.
7. Είμαι τώρα σε δίαιτα.

4. Σε σύγκριση με άλλα πράγματα στη ζωή σου, πόσο σημαντικό είναι το βάρος σου για εσένα;

1. Το βάρος μου δεν είναι σημαντικό σε σύγκριση με άλλα πράγματα στη ζωή μου.
2. Το βάρος μου είναι λίγο πιο σημαντικό από μερικά άλλα πράγματα στη ζωή μου.
3. Το βάρος μου είναι πιο σημαντικό από ότι τα περισσότερα, αλλά όχι από όλα, τα πράγματα στη ζωή μου.
4. Το βάρος μου είναι το πιο σημαντικό πράγμα στη ζωή μου.

5. Αισθάνεσαι ποτέ χοντρός/ή;

(1)	(2)	(3)	(4)	(5)
Ποτέ	Σπάνια	Μερικές φορές	Συχνά	Πάντα

Marlowe-Crowne Social Desirability Scale (MCSD)

Πιο κάτω παρουσιάζονται δηλώσεις που αφορούν προσωπικές συμπεριφορές και χαρακτηριστικά. Διαβάστε το κάθε στοιχείο και αποφασίστε εάν αυτό αληθεύει για εσάς (ΟΡΘΟ) ή όχι (ΛΑΘΟΣ).

1. Μερικές φορές είναι δύσκολο για εμένα να προχωρώ με τη δουλειά μου όταν δεν με ενθαρρύνουν	ΟΡΘΟ ΛΑΘΟΣ
2. Μερικές φορές αισθάνομαι πικραμένος όταν δεν γίνεται το δικό μου	ΟΡΘΟ ΛΑΘΟΣ
3. Σε μερικές περιπτώσεις, έχω παραιτηθεί από κάτι επειδή υποτίμησα τις ικανότητές μου	ΟΡΘΟ ΛΑΘΟΣ
4. Έχουν υπάρξει στιγμές που ήθελα να επαναστατήσω ενάντια σε ανθρώπους που έχουν κάποια εξουσία παρόλο που ήξερα ότι είχαν δίκαιο	ΟΡΘΟ ΛΑΘΟΣ
5. Ανεξαρτήτως σε ποιον μιλώ, πάντα είμαι καλός ακροατής	ΟΡΘΟ ΛΑΘΟΣ
6.Έχουν υπάρξει περιπτώσεις που έχω εκμεταλλευτεί κάποιον	ΟΡΘΟ ΛΑΘΟΣ
7. Όταν κάνω ένα λάθος, είμαι πάντοτε πρόθυμος να το παραδεχθώ	ΟΡΘΟ ΛΑΘΟΣ
8. Μερικές φορές προσπαθώ να εκδικούμαι αντί να συγχωρώ και να ξεχνώ	ΟΡΘΟ ΛΑΘΟΣ
9. Είμαι πάντοτε ευγενικός, ακόμα και με ανθρώπους που είναι δύσκολοι	ΟΡΘΟ ΛΑΘΟΣ
10. Δεν έχω εκνευριστεί ποτέ όταν άνθρωποι εκφράζουν ιδέες πολύ διαφορετικές από τις δικές μου	ΟΡΘΟ ΛΑΘΟΣ
11. Έχουν υπάρξει στιγμές που ζήλεψα πολύ την καλή τύχη των άλλων	ΟΡΘΟ ΛΑΘΟΣ
12. Μερικές φορές εκνευρίζομαι από ανθρώπους που μου ζητούν χάρες	ΟΡΘΟ ΛΑΘΟΣ
13. Δεν έχω πει ποτέ κάτι σκόπιμα που να πληγώσει τα αισθήματα κάποιου	ΟΡΘΟ ΛΑΘΟΣ

Brief Fear of Negative Evaluation Scale (BFNE)

Διαβάστε το κάθε στοιχείο προσεκτικά και δηλώστε πόσο σας χαρακτηρίζει με βάση την πιο κάτω κλίμακα:

1 = Δε με χαρακτηρίζει καθόλου

2 = Με χαρακτηρίζει ελάχιστα

3 = Με χαρακτηρίζει μέτρια

4 = Με χαρακτηρίζει πολύ

5 = Με χαρακτηρίζει πάρα πολύ

1. Ανησυχώ για το τι θα σκεφτούν οι άλλοι για μένα, ακόμα κι όταν ξέρω πως αυτό δε βοηθάει. ----------
2. Με ενοχλεί όταν οι άνθρωποι σχηματίζουν μη ευνοϊκή εντύπωση για μένα. ---------
3. Συχνά φοβάμαι ότι οι άλλοι άνθρωποι θα προσέξουν τις αδυναμίες μου. ----------
4. Ανησυχώ για το τι είδους εντύπωση δίνω στους άλλους. ----------
5. Φοβάμαι ότι οι άλλοι δε θα με επιδοκιμάσουν. ----------
6. Φοβάμαι ότι οι άνθρωποι θα με κατηγορήσουν. ----------
7. Με απασχολεί η γνώμη των άλλων ανθρώπων για μένα. ----------
8. Όταν μιλάω σε κάποιον, ανησυχώ για το τι μπορεί να σκέφτονται για μένα. --------
9. Συνήθως ανησυχώ για το τι είδους εντύπωση δίνω. ----------
10. Όταν ξέρω ότι κάποιος με κρίνει, αυτό έχει την τάση να με ενοχλεί. ----------
11. Μερικές φορές σκέφτομαι ότι με απασχολεί το τι σκέφτονται οι άλλοι για μένα περισσότερο απ᾽όσο θα έπρεπε. ----------
12. Συχνά ανησυχώ ότι θα κάνω ή θα πω λάθος πράγματα. ----------

Participants in the informed group were asked to self-report their height and weight after being informed both verbally and in writing that they will be measured afterwards.

PN: ....

Ερωτηματολόγιο για βάρος και ύψος

Παρακαλώ απαντήστε στις παρακάτω ερωτήσεις για το βάρος και το ύψος σας. Στη συνέχεια θα ακολουθήσουν μετρήσεις του βάρους και ύψους σας.

1. Παρακαλώ συμπλήρωσε το βάρος σου.

....

2. Πόσο σίγουρος/η είσαι για την απάντησή σου στην προηγούμενη ερώτηση;

(1)	(2)	(3)
Σίγουρος/η	Μάλλον σίγουρος/η	Καθόλου σίγουρος/η

3. Παρακαλώ συμπλήρωσε το ύψος σου.

....

4. Πόσο σίγουρος/η είσαι για την απάντησή σου στην προηγούμενη ερώτηση;

(1)	(2)	(3)
Σίγουρος/η	Μάλλον σίγουρος/η	Καθόλου σίγουρος/η

Participants in the uninformed group were asked to self-report their height and weight unaware about the upcoming actual measurements. Following that, they were asked additional questions to find out if they had perceived the experimental manipulation.

PN: ....

Ερωτηματολόγιο για βάρος και ύψος

Παρακαλώ απαντήστε στις παρακάτω ερωτήσεις για το βάρος και το ύψος σας.

1. Παρακαλώ συμπλήρωσε το βάρος σου.

....

2. Πόσο σίγουρος/η είσαι για την απάντησή σου στην προηγούμενη ερώτηση;

(1)	(2)	(3)
Σίγουρος/η	Μάλλον σίγουρος/η	Καθόλου σίγουρος/η

3. Παρακαλώ συμπλήρωσε το ύψος σου.

....

4. Πόσο σίγουρος/η είσαι για την απάντησή σου στην προηγούμενη ερώτηση;

(1)	(2)	(3)
Σίγουρος/η	Μάλλον σίγουρος/η	Καθόλου σίγουρος/η

PN: ....

1. Ποιος νομίζεις ότι ήταν ο σκοπός της έρευνας;

....

....

2. Είχες υποψιαστεί ότι θα μετρήσουμε το βάρος και το ύψος σου;

....

....

Appendix J. Information Sheet

Πανεπιστήμιο
Κύπρου

Τμήμα Ψυχολογίας
Πανεπιστήμιο Κύπρου
P.O. Box 20537, 1678,
Λευκωσία
email: kkeli.natalie@ucy.ac.cy

Πληροφορίες για Συμμετέχοντες

Καλείστε να συμμετάσχετε σε μια έρευνα που διεξάγεται από τη διδακτορική φοιτήτρια Κλινικής Ψυχολογίας του Πανεπιστημίου Κύπρου, Νάταλη Κκέλη. Προτού αποφασίσετε αν θα συμμετάσχετε στην έρευνα, σας παρέχονται κάποιες σχετικές πληροφορίες.

Τι αφορά αυτή η έρευνα;
Ο σκοπός της παρούσας έρευνας είναι η μελέτη θεμάτων διατροφής, εικόνας σώματος και προσωπικών χαρακτηριστικών των φοιτητών και φοιτητριών στην Κύπρο.

Τι θα συμβεί αν συμμετάσχω;
Εάν αποφασίσετε να συμμετάσχετε στην έρευνα, θα καλεστείτε να συμπληρώσετε μερικά ερωτηματολόγια σχετικά με τη διατροφή, την εικόνα σώματος και τα προσωπικά σας χαρακτηριστικά. Η συμμετοχή σας στην έρευνα θα διαρκέσει περίπου 25 λεπτά.

Θα έχω προσωπικό όφελος από την συμμετοχή;
Με τη συμμετοχή σας στην έρευνα θα λάβετε ποσοστό βαθμολογίας.

Θα υπάρξουν ενδεχόμενοι κίνδυνοι από την συμμετοχή μου;
Η συμμετοχή σας στην έρευνα δεν ενδέχεται να προκαλέσει οποιοδήποτε κίνδυνο.

Είναι υποχρεωτική η συμμετοχή μου;
Η συμμετοχή σας στην έρευνα είναι εθελοντική. Ακόμα και αν αποφασίσετε να συμμετάσχετε, έχετε δικαίωμα να αποσυρθείτε από την έρευνα δίχως να εξηγήσετε τον λόγο της απόσυρσής σας και χωρίς οποιεσδήποτε επιπτώσεις.

Η συμμετοχή μου στη μελέτη θα είναι εμπιστευτική;
Οι πληροφορίες που θα συλλεχθούν κατά τη διάρκεια της έρευνας θα παραμείνουν εντελώς εμπιστευτικές και θα χρησιμοποιηθούν μόνο για τους σκοπούς της παρούσας έρευνας. Τα προσωπικά δεδομένα θα κωδικοποιηθούν με την μορφή αριθμών ώστε να διατηρηθεί η ανωνυμία και η προστασία των προσωπικών σας δεδομένων. Τα δεδομένα που θα συλλεχθούν θα αποθηκευτούν σε προστατευμένο υπολογιστή με κωδικό πρόσβασης και θα καταστραφούν πέντε χρόνια μετά την ολοκλήρωση της έρευνας.

Τι θα συμβεί στη συνέχεια;
Εάν επιθυμείτε να συμμετάσχετε στην έρευνα, θα πρέπει να δηλώσετε τα στοιχεία επικοινωνίας σας, έτσι ώστε να επικοινωνήσει μαζί σας η ερευνήτρια, για να διευθετήσετε ατομική συνάντηση. Η ατομική συνάντηση θα διεξαχθεί σε χώρο του πανεπιστημίου.

Ποιος έχει ελέγξει την έρευνα;
Η έρευνα έχει ελεγχθεί και εγκριθεί από την Εθνική Επιτροπή Βιοηθικής Κύπρου.

Εάν επιθυμείτε να συμμετάσχετε στην έρευνα δηλώστε τα στοιχεία επικοινωνίας σας πιο κάτω.

ΟΝΟΜΑΤΕΠΩΝΥΜΟ: ....
ΤΜΗΜΑ: ....
ΕΤΟΣ ΣΠΟΥΔΩΝ: ....
ΤΗΛΕΦΩΝΟ ΕΠΙΚΟΙΝΩΝΙΑΣ/ EMAIL: ....

Appendix K. Measurement Form

PN: …………….

Έντυπο Μετρήσεων

Ημερομηνία:
Ώρα:
Μέτρηση Βάρους (kg):
Μέτρηση Ύψους (cm):
Μετρήσεων Βάρους:
Μετρήσεων Ύψους:
Παρατηρήσεις/ Σχόλια:

Appendix L. Debrief Sheet

Πανεπιστήμιο Κύπρου

Τμήμα Ψυχολογίας
Πανεπιστήμιο Κύπρου
P.O. Box 20537
1678, Λευκωσία
email: kkeli.natalie@ucy.ac.cy

<u>Τίτλος έρευνας:</u> The differences between self-reported and measured height and weight: Detection, examination and manipulation

Σας ευχαριστούμε για την συμμετοχή σας στην έρευνα. Στο έντυπο παρέχονται σχετικές πληροφορίες για το σκοπό για τον οποίο διεξάγουμε την έρευνα. Εάν υπάρχουν οποιεσδήποτε ερωτήσεις ή χρειάζεστε διευκρινίσεις για τη διαδικασία της έρευνας μη διστάσετε να ρωτήσετε την ερευνήτρια.

Σας έχει αναφερθεί ότι ο **σκοπός** της έρευνας ήταν η εξέταση θεμάτων διατροφής, εικόνας σώματος και προσωπικών χαρακτηριστικών των φοιτητών στην Κύπρο. Στην πραγματικότητα, μας ενδιέφερε να εξετάσουμε εάν τα άτομα που τους είχε λεχθεί ότι θα ζυγιστούν και θα μετρηθούν αφότου δήλωναν το βάρος και το ύψος τους, δήλωναν με λιγότερη ή περισσότερη ακρίβεια το βάρος και το ύψος τους, σε σύγκριση με τα άτομα που γνώριζαν από την αρχή ότι θα μετρηθούν. Για την διασφάλιση του σκοπού της έρευνας, δεν μπορούσαμε να αποκαλύψουμε τις λεπτομέρειες του πειράματος στην αρχή της διαδικασίας.

Όπως έχει ήδη αναφερθεί η συμμετοχή σας στην έρευνα είναι **εθελοντική**. Εάν επιθυμείτε, μπορείτε να αποσυρθείτε από την έρευνα σε αυτό το σημείο, και όλα τα δεδομένα που μαζεύτηκαν από τη συμμετοχή σας θα καταστραφούν, χωρίς να έχετε οποιεσδήποτε επιπτώσεις.

Εξαιτίας της φύσης της έρευνας, θα θέλαμε να σας παρακαλέσουμε να **μην μοιραστείτε οποιαδήποτε πληροφορία** που αφορά τη διαδικασία του πειράματος με άλλους συμφοιτητές σας. Ο κύριος λόγος είναι ότι τα σχόλιά σας θα μπορούσαν να επηρεάσουν την επίδοση άλλων συμμετεχόντων. Η μη συμμόρφωση με αυτό το αίτημα μπορεί να έχει σοβαρές επιπτώσεις στην ακρίβεια των δεδομένων. Ελπίζουμε ότι θα υποστηρίξετε την έρευνά μας διατηρώντας τις πληροφορίες σχετικά με αυτή τη μελέτη εμπιστευτικές.

Εάν κατά τη διάρκεια ή με την ολοκλήρωση της έρευνας αισθανθήκατε ότι χρειάζεται να μιλήσετε με κάποιο ειδικό για θέματα διατροφής ή οποιοδήποτε άλλο θέμα σας απασχολεί μπορείτε να επικοινωνήσετε με το Κέντρο Ψυχικής Υγείας (ΚΕΨΥ) του πανεπιστημίου σας στο τηλέφωνο (+357) 22892136.

Σε αυτό το σημείο που έχετε ενημερωθεί για τον πραγματικό σκοπό της έρευνας, επιθυμείτε τα προσωπικά σας δεδομένα να συμπεριληφθούν στην έρευνα;

☐ **ΝΑΙ, επιθυμώ τα προσωπικά μου δεδομένα να συμπεριληφθούν στην έρευνα.**

☐ **ΟΧΙ, δεν επιθυμώ τα προσωπικά μου δεδομένα να συμπεριληφθούν στην έρευνα.**

________________________ ____________________

ΟΝΟΜΑΤΕΠΩΝΥΜΟ ΥΠΟΓΡΑΦΗ