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Pinch, cinch or step: Evaluating the effectiveness and acceptability of mid upper arm circumference measurements in adolescents with eating disorders

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ABSTRACT

Purpose: Mid Upper Arm Circumference (MUAC) measurement is proposed as an adjunctive measure of re-nutrition progress in youth with eating disorders. We propose that MUAC is a clinically-useful measurement that can be used to inform clinicians about treatment progress. The aims of this study were twofold: 1) to test whether assessments of MUAC can track weight restoration in a similar pattern to direct measures of weight and 2) to examine adolescents' self-reported feelings in response to assessments of MUAC, weighing, and skinfolds (SF).

Methods: The study involved two phases of data collection. Participants in both phases of the study were female patients who fulfilled DSM IV-TR diagnostic criteria for an eating disorder. In Phase 1, MUAC measurements and weight assessments were collected weekly to examine changes in these values during the first 8 weeks of treatment. In Phase 2, participants reported their feelings towards three different anthropometric measures — weight, SF and MUAC.

Results: Simple contrasts between the weekly weight and MUAC assessments prospectively collected in Phase 1 (N = 40) reveal that MUAC and weight follow similar patterns over time. Phase 2 (N = 30) data indicate that participants felt more relaxed, and less angry, scared or embarrassed during MUAC measurements than weighing and SF. MUAC also emerged as the measurement that was most preferred by participants.

Conclusions: MUAC measurements are a useful adjunct to measurements of weight, and are perceived to be less distressing than routinely used measurement techniques of weight and SF.

1. Introduction

Anthropometric measurements are frequently used in eating disorder treatment as part of physical assessment of recovery. In children and adolescents, key components of measuring progress towards recovery in individuals who are underweight include tracking changes in weight and body composition and monitoring for a return to growth and pubertal development (Campbell & Peebles, 2014; Frisch & McArthur, 1974). However, weight and related indices of Body Mass Index (BMI) and Percentage Suggested Body Weight (%SBW) can be subject to manipulation. Jaffa, Davies, and Sardesai (2011) reported that 30–57% of adolescents patient who were seen in an inpatient or outpatient setting, admitted to weight falsification. There is also relatively little research on the effects of anthropometry-related feedback on psychological distress in patients with eating disorders. Longitudinal studies demonstrated that frequent self-weighing was predictive of disordered eating behaviors and binge eating in female adolescents (Neumark-Sztainer, van den Berg, Hannan, & Story, 2006), and that negative weight-related feedback was associated with significant distress and over-eating behavior in a non-clinical sample (McFarlane, Polivy, & Herman, 1998). But to our knowledge, no studies have compared the psychological reactions of patients with eating disorders to different anthropometric measurements.

The World Health Organization has been using Mid Upper Arm Circumference (MUAC) measurements to assess malnutrition in areas of need since 1992, as it predicts mortality better than weight and height (Fernández, Delchevalerie, & Van Herp, 2010; Myatt & Duffield, 2007). The Academy of Nutrition and Dietetics recently released a statement recommending the use of MUAC for the identification and documentation of pediatric malnutrition (Becker et al., 2014). In 2009, Martin,

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Pascoe, and Forbes (2009) noted that among adolescent outpatients with eating disorders, MUAC less than 19 cm predicted the need for urgent medical admission. However, there is limited information on changes in MUAC during re-feeding in adolescents with an eating disorder and MUAC is not part of internationally recognized clinical management guidelines for eating disorders (Campbell & Peebles, 2014).

Weekly measurements of weight are a common component of outpatient and inpatient treatment plans for youth with eating disorders. There are, however, potential limitations of relying on this method as a sole measure of progress given time-of-day fluctuations or fluid retention, and that youth in treatment programs report regular manipulation of their weight (e.g., water loading prior to weight assessment). We therefore aim to investigate MUAC as a potential adjunct to weight measurements. We propose that MUAC is a tolerable and reliable procedure when used in conjunction with weight on a weekly basis. The first aim of this study is to test whether MUAC measurements track changes in weight restoration in a similar pattern to measures of weight. The second aim is to examine adolescents' feelings in response to assessments of three anthropometric measures: MUAC, weighing, and skinfolds (SF).

2. Methods

The protocol for the study was approved by the ethics review board of British Columbia Children's Hospital. Participants in both phases fulfilled DSM IV-TR (American Psychiatric Association, 2000) diagnostic criteria for an eating disorder and were less than 85% of SBW at admission. Recruitment was limited to female patients because of the predominance of girls admitted to the unit and potential variance associated with gender. Informed consent for both phases was obtained by a research assistant. For participants under 14 years, parental consent was obtained along with participants' assent. SPSS 22 was used for all analyses.

2.1. Phase 1

2.1.1. Procedures

Adolescent females admitted for intensive treatment in a specialized eating disorders' treatment program for children and adolescents (inpatient or day treatment) were approached for recruitment from September 2011 to March 2012.

2.1.2. Sample

Participants (N = 40) were between 11 and 18 years of age (average = 15.7). All were diagnosed with Anorexia Nervosa (AN) except one who was diagnosed with Eating Disorder Not Otherwise Specified (EDNOS). The average %SBW at admission was 75.01 (SD = 6.58).

2.1.3. Measures

MUAC (in cm) and weight (in kg) were assessed on admission and weekly thereafter over an eight-week period.

2.1.3.1. MUAC. MUAC was obtained by determining the midpoint between the acromial and olecranon processes with anthropometric tape and then measured the circumference at this point to the nearest 100th of a centimeter. MUAC was measured by clinical staff in a private clinic room.

2.1.3.2. Weight. Weight was obtained weekly by nursing staff. Participants were dressed in a hospital gown (inpatient program) or in one layer of light clothing, without shoes (patients in day treatment). The same scale, located in a private room, was used for all participants.

2.2. Phase 2

2.2.1. Procedures

Recruitment for Phase 2 was from August 2013 to April 2014; no participants in Phase 1 were recruited for Phase 2. Adolescent females aged 10 to 18 years were recruited if they had all three methods of anthropometric measurements (i.e., weight, MUAC, SF) assessed at least once within the previous 12 months at any one of the Eating Disorders Program streams (inpatient, day program or outpatient). Weighing and MUAC proceeded as per routine clinical care (see Phase 1). The SF measurements were conducted by an experienced dietitian who explained the process prior to performing the assessments. SF measurements are taken with the patient in a hospital gown in a private clinic room from four body sites — triceps, biceps, subscapular and supra-iliac, using Harpenden® calipers. Feedback is then provided to the patient individually and incorporates comparisons to normative levels for their age and sex.

2.2.2. Sample

A trans-diagnostic sample of participants was recruited (N = 30), ranging in age between 12 and 18 years (average = 15.46).

2.2.3. Measures

2.2.3.1. Feelings about anthropometric measurements. Participants were asked to rate a list of 18 feelings (generated by the investigators based on their clinical experience; see 2 for list) towards each anthropometric measure (weight, SF, MUAC) on a 5-point Likert-type scale ranging from "not at all" (1) to "very much" (5).

2.2.3.2. Rankings. Participants were asked to rank their preference of three anthropometric measures (weight, SF, MUAC) using a forced-choice item. They were also asked to indicate the measure they thought was the best indicator of health and the measure they felt was the worst indicator of health.

3. Results

3.1. Phase 1

As with all longitudinal research, some data (2.8% of values) were missing. Little's test of missingness was not statistically significant for weight [X^2 (41) = 40.030, p = .51] or MUAC [X^2 (80) = 61.109, p = .94] suggesting that the patterns of missingness are unlikely to be due to an unmeasured variable related to MUAC or weight. Eliminating cases with missing data introduces more bias than imputing missing information (Graham, 2012). Missing data were imputed using the Expectation–Maximization algorithm.

Two repeated-measures analysis of variance (RM-ANOVA) were conducted to describe the week-to-week changes in weight and MUAC measurements from admission to 8 weeks post-admission. Changes between weeks were compared using within-subjects repeated contrasts. These analyses were not tests of patients' progress; they provided a comparison of changes in weight and MUAC over the same period. The assumption of sphericity was violated in both RM-ANOVAs so the Huynh–Feldt correction was used for tests of within-subject effects. The overall models were statistically significant for weight [F (1.65, 64.38) = 262.95, p < .001] and MUAC [F (1.71, 66.73) = 137.54, p < .001]. All within-subject repeated contrasts were significant. Means, SD, and effect sizes (r) for within-subject contrasts (repeated) are displayed in Table 1. The expected significant changes between weekly assessments of MUAC follow the pattern of weight change. Effect sizes for changes in weight and MUAC are comparable for the first five weeks.