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**Educational and Mental Health implications of the Multidimensional Model of
the Self-concept for Adolescent Girls:
Comparison of Clinical and Non-clinical Samples**

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The importance of a positive self-concept as an educational outcome and a facilitator of other desirable outcomes are well established within the education research field. Although the multidimensional and hierarchical model of the self-concept is widely accepted within educational psychology, this perspective is not widely used within the mental health research. Hence, the purpose of the present investigation is to compare the psychometric properties of the short version of the Self-Description Questionnaire (SDQII-S) based on responses by a large sample of female adolescent high school students ($N= 829$) and a clinical sample of adolescent girls who have been diagnosed with anorexia nervosa ($N= 75$). Data show that the well-established psychometric properties of the longer version of the SDQII generalise well to both samples of adolescent girls, and analyses provided good support for the invariance of the factor structure across the two samples. Furthermore, analyses employing new structural equation modelling approaches to comparing the latent mean differences indicated that there were differences (although surprisingly small) between the two groups that were generally consistent with a priori predictions. The important educational and clinical implications of these results are discussed.

Disturbed Eating and Anorexia Nervosa in Adolescent Girls

Anorexia nervosa is a very complex psychiatric disorder (Casper, 1998; Chan & Ma, 2002) with both severe and potentially fatal physical and mental health consequences (Becker, Grinspoon, Klibanski, & Herzog, 1999; Bryant-Waugh, 1993). It is a disorder that most commonly occurs in adolescent girls and has been reported as being the third most common chronic illness that affects adolescent girls after asthma and obesity (Jimerson, Pavelski, Orliss & D'Agruma, 2002).

As incidence rates in female adolescents increase, researchers have suggested that anorexia nervosa and associated eating disorders are also affecting an increasing number of adolescent boys. Incidence and prevalence rates for the disorder have increased rapidly over the last several decades, possibly due to an increase in awareness and knowledge about the disorder, and have been cited as ranging from 0.5% and 3.7% for women (Deshmukh & Franco, 2003; Fairburn & Harrison, 2003). The severity and chronicity of the disorder that affects an alarming proportion of today's adolescents is obvious when examining the statistics for prognosis and outcome for patients. Some researchers report that only fifty percent of patients are expected to fully recover (Gowers, Weetman, Shore, Hossain, & Elvins, 2000), and a significant portion (ten percent) of them still meet diagnostic criteria twenty-one years after diagnosis (Lowe et al., 2001). Furthermore, mortality rates for sufferers of Anorexia, exceed any other psychiatric disorder (Casper, 1998; Gowers et al., 2000; Herzog, Deter, Fiehn, & Petzold, 1997; Herzog, Schellberg, & Deter, 1997).

How can educators/teachers and parents recognise anorexia nervosa?

As educational institutions have a great deal of contact with a population that is most at risk of anorexia nervosa (adolescents), it is imperative that educators and school counsellors in Australia and around the world understand Anorexia Nervosa, and the factors that may influence the onset and development of the disorder. Schools and teachers are in a uniquely

strong position to be able to develop and maintain prevention strategies and educate their students about issues relating to eating disorders, coping strategies, and the importance of healthy development (physical, emotional and psychological). Hence, by gaining a deeper understanding of the disorder and its' features, educational institutions may be able to develop educational programs that help stem the ever increasing incidence of the illness in the adolescent population.

The diagnostic criteria for anorexia nervosa according to the Diagnostic and Statistical Manual IV-TR (DSM IV-TR; (American Psychiatric Association, 2000) includes a morbid fear of fat, and gaining weight, a distorted body image, and a refusal or inability to maintain the minimum healthy body weight. For post menarcheal girls, amenorrhoea caused by substantial weight loss, is also common feature (American Psychiatric Association, 2000). Additionally, patients with eating disorders often deny or do not recognise the chronicity or the severity of their illness.

So how can educators recognise eating disorders in their students? It has been reported that patients with anorexia nervosa tend to begin by restricting their diets; commonly patients will begin by cutting out certain foods, and progress to skipping meals. Additionally, others will recognise that sufferers will start to get worried and anxious around meal times. Individuals may also become preoccupied with eating, and their body. Autobiographical accounts written by sufferers and their significant others have reported that when sufferers do eat (regardless of the quantity of food), they feel guilty, and compensate for the food intake by obsessively exercising in an attempt to burn off the calories. As the disorder perpetuates, clinicians have found that sufferers become more irritable, and moody, and become socially isolated from family and friends. If dietary restraint continues, some physical symptoms such as: sensitivity to cold, lack of energy, and the growth of downy hair on the body (fine hair that covers the body so as to protect the body from the cold) become obvious. For female sufferers who already started menstruating prior to the development of the disorder, menstrual cycles stop as a result of the rapid weight loss (*An Eating Disorders Resource for Schools. A Manual to promote early intervention and prevention of eating disorders in schools*, 2004; Rey, 2002).

Despite the amount of research that has been conducted to gain a better understanding of the disorder, anorexia nervosa is very complex; the cause eating disorders is multifactorial and hence, although factors such as pubertal changes may have some explanatory power, it may be only one in an array of risk factors, including social (for example socio-cultural, media influences and peer relationships), environmental, genetic, personal (such as personality and self-esteem factors) and familial factors (including familial dysfunction and discord) (Grogan, 1999; Paxton, 1996; Polivy & Herman, 2002; Schwartz, Phares, Tantleff-Dunn, & Thompson, 1999; White, 2000). Given the complexity of eating disorders, and the multitude of factors that may be involved in the development and maintenance of the disorder, it has difficult for researchers, clinicians and the general public to understand.

Since early writings about the manifestation and aetiology of eating disorders, theorists have argued that a deficit in the self-concept is a diagnostic feature of the illness (Bruch, 1962). Although its role in the development and maintenance of anorexia has been contentious, more recent depictions of patients with eating disorders have also included a negative sense of self as a core component of eating disorders (American Psychiatric Association, 2000), and as a result, self-esteem research has been a major focus in the eating disorders field with researchers consistently associating self-esteem and eating disorders (bulimia, anorexia and other associated eating disorders) (see for example: (Button & Warren, 2002; Casper, 1998; George, 1997; Jacobi, Paul, de Zwann, Nutzinger, & Dahme, 2004; Nelson, Hughes, Katz, & Searight, 1999; Polivy & Herman, 2002; White, 2000). To highlight this, a community study conducted in the United Kingdom showed that schoolgirls aged between 11 and 12 years with low self-esteem were eight times more likely to develop problems associated with eating by mid adolescence (Button, Sonuga-Barke, Davies, &

Thompson, 1996). In support of this (Bardone, Perez, Abramson, & Joiner, 2003) argued that high levels of self-esteem are a buffer for disturbed eating attitudes and behaviours proposing that individuals with low self-esteem are more likely to be susceptible to pressures to be thin, and are more likely to engage in dieting behaviour.

Although many links have been made between self-esteem and anorexia nervosa, self-esteem is a global construct comprised of overall evaluations of the self, and thus very little is known about how context may influence this relationship between the self and eating disorders. That is, very little is known about which facets of the self are lower for girls with eating disorders, and which (if any) are comparable to girls who have not been diagnosed with anorexia. It is plausible that girls with eating disorders, do in fact have lower evaluations about themselves in general, but do they also evaluate themselves more negatively at school or in their social relationships in comparison to their peers without eating disorders?

As positive self-esteem has many desired outcomes for both health and education it is a construct that schools, teachers and clinicians are already targeting in health promotion programs for adolescents and students, and hence a more in depth understanding of its' association with eating disorders is vital.

What is the self-concept and why is it important?

The self-concept has been defined as the cognitive evaluations (involving descriptions, prescriptions and expectations) that an individual may have about himself or herself that can influence both current behaviours and future aspirations (Ha, 2002; Hattie, 1992). Despite the long debated history about the nature and structure of the self-concept, the importance of a positive self-concept for development, and adaptive behaviour is undeniable and is widely recognised in many psychological and educational research disciplines (Byrne, 1996; Marsh & Craven, 1997; Shavelson, Hubner, & Stanton, 1976).

Self-concept research is highly relevant to many important individual and societal problems. Branden (1994) attests to the significance of the self-concept/self-esteem construct and outcomes that are mediated by it, stating that:

“I cannot think of a single psychological problem from anxiety to depression, underachievement at school or work, to fear of intimacy, happiness or success, to alcohol or drug abuse, to spouse battering or child molestation, to co-dependency and sexual disorders, to passivity and chronic aimlessness, to suicide and crimes of violence- that is not traceable, at least in part, to the problem of deficient self-esteem” (p. xv).

Although the literature on the self-concept has been confusing (Hattie, 1992), it is generally accepted that positive self-concept both an important outcome variable, and a vital facilitator for other positive educational, health, and psychological outcomes (Guillon, Crocq, & Bailey, 2003; Marsh & Craven, 1997). For example, negative/ low self-concepts are often associated with behavioural problems in students, delinquency, depression, anxiety and disturbed eating habits, whereas a positive or high self-concept is often associated with positive development and adaptive functioning throughout the developmental lifespan (Harter & Marold, 1991).

The Structure of the Self-concept: Multidimensional vs Unidimensional Self-concept

Early conceptualisations of the self-concept specified that it was comprised of several different facets including the material self (or the body), the social self, the spiritual self (derived from an individuals' understanding of the inner being), and the pure ego (James, 1890/1963, cf. Brinthaupt & Lipka, 1992; Marsh & Hattie, 1996). Despite this early theoretical conceptualisation of the structure of the self-concept, prior to the 1980's research

failed to provide strong evidence to support the existence of multiple dimensions within the self (Brinthaupt & Lipka, 1992). Hence, much of the early work investigating the self-concept adopted a unidimensional approach to the self-concept, employing terms such as self-esteem, self-worth and general/global self-concept (Marsh, Parada, & Ayotte, 2004). Furthermore, researchers such as Marx and Winnie (1978) argued that the self appeared to be more of a unitary and singular construct than one that was comprised of multiple facets, and thus a general measure of the self was adequate to assess how individuals felt about themselves, and thus how this could be related to other constructs such as well-being, health, achievement, motivation, happiness and depression (Harter & Marold, 1991).

Over the last two decades however, researchers have challenged this traditional notion of the singular, global nature of the self-concept, arguing that such an approach does little but to mask the possible role that context may have on the evaluations of the self (Harter, 1990). Despite the questions raised about the usefulness of the unidimensional approach to the self-concept, researchers have persisted with the use of instruments that only assess global self-concept, such as the Rosenberg Self-esteem Scale (Rosenberg, 1965) and the Coopersmith Self-esteem Inventory (Coopersmith, 1987). (Byrne, 1996) explains that this may be the reason that such inconsistent results regarding the self-concept have plagued developmental, educational and mental health research.

To address the shortcomings of past research in the field, a multidimensional model of the self-concept was developed by (Shavelson et al., 1976) in which the various facets of the self were identified, and organised in a hierarchical structure. Shavelson et al proposed that at the apex of the multidimensional model is general self-concept, which is thus divided into academic (maths and reading self-concepts) and non-academic components (social, emotional and physical self-concepts). However, at the time that this multidimensional model was developed, a reliable and valid instrument that could assess the multiple facets of the self, had not yet been developed, and thus, although intuitively appealing, support for the model was weak.

Shavelson et al's (1976) early work sparked the revival of the multidimensional self-concept and subsequently led to the development of the Marsh/Shavelson model of the self-concept (1985). The Marsh/Shavelson model of the self-concept further divided the academic self-concept into distinct dimensions of math and verbal self-concepts and combined the physical and social components of the non academic self-concept. Based on the strong theoretical underpinnings of this model, Marsh developed a series of Self Description Questionnaires (SDQ) to assess the multiple dimensions of the self-concept in preadolescents (SDQI), adolescents (SDQII) and adults (SDQIII). The SDQ instruments are now recognised as amongst the most valid and well-established instruments that can reliably assess the multiple dimensions of the self-concept (Byrne, 1996; Hattie, 1992). More recently, Marsh has also extended his instruments to include an instrument that evaluates the multiple facets of the self-concept of preadolescents with mild intellectual disabilities (SDQIA), and has most recently developed a short version of the widely accepted SDQII instrument for adolescents (SDQII-S).

Self-concept research within the mental health sector and in eating disorders research

Although many authors have associated perceptions of the self to psychological and psychiatric problems, researchers have traditionally employed the unidimensional approach to the self-concept and thus very little research has utilised the multidimensional model of the self-concept. In one of the first studies conducted in the mental health sector, Marsh et al (2004) investigated how the different facets of the self-concept are related to various aspects of mental health (as measured by the Youth Self-Report). This study provided strong support for the multidimensional model of the self-concept in mental health, by showing that the

different dimensions of the self-concept were differentially related to the various scales of the YSR. Surprisingly, despite the recent emphasis on the multidimensional model of the self-concept in other fields of research (particularly in educational psychology), investigators within the mental health sector are yet to adopt the more descriptive model to assist them in the development of more sophisticated and specific aetiology and treatment models.

The benefits of adopting such a model are obvious, as Marsh and Craven (1997) state “if the role of self-concept research is to better understand the complexity of self in different contexts, to predict a wide variety of behaviours, to provide outcome measures for diverse interventions, and to relate self-concept to other constructs, then the specific domains of the self-concept are more useful than a general domain” (p. 191). Furthermore, understanding the relations between the different facets of the self and other constructs would advantage clinicians and researchers alike, as it would enable them to gain a deeper understanding mental health issues and how they are related to the various dimensions of the self.

One particular field within the mental health sector that has been heavily reliant on the unidimensional approach of the self-concept and instruments such as the Rosenberg Self-esteem Scale and Coopersmith Self-esteem Inventory is the eating disorders field. For example, (Button & Warren, 2002) using the Rosenberg Self-esteem Scale showed that low self-esteem is associated with higher eating attitudes disturbance in anorexic patients, both before treatment and 7.5 years after treatment.

More recently, (Jacobi et al., 2004) utilised the Rosenberg Self-esteem scale to determine whether patients with eating disorders had lower global self-evaluation scores than normal healthy controls and depressed psychiatric patients. Results indicated that although self-esteem for eating disordered patients in comparison to non-clinical patients, self-esteem as measured by the Rosenberg scale could not differentiate between depressed and eating disordered patients. This result suggests that low global self-esteem cannot be considered as a characteristic that is specific to the eating disordered population. Furthermore, (Griffiths et al., 1999) found that although eating disordered patients exhibit low self-esteem (as measured by the Rosenberg Self-esteem Scale and Coopersmith Self-esteem Inventory), there is no evidence to suggest that there is a difference between subtypes. These results perhaps highlight one of the strengths in adopting a multidimensional approach to the self-concept, as self-concept profiles (ie aspects of the self-concept) may differ between clinical samples.

In 1996, Swift, Bushnell, Hanson, and Logemann recognised that evaluations of the self involved measuring different components of the self-concept such as the self in relation to social behaviours, and the self in relation to emotional tone, body image and attitudes using two different self-concept measures. The results of this study indicated that adolescent girls with anorexia had mixed self-concept profiles in that they showed good adjustment in areas such as education, but poor adjustment in social, body and emotional related areas and thus further emphasizes the need to evaluate the multiple dimensions of the self-concept rather than global self-esteem.

Following this, Bardone et al (2003) adopted a model of the self-esteem in which self-esteem was a bidimensional construct comprising of self-liking (self-worth) and self-competence (efficacy) (see Tafarodi & Swann). In supporting the bidimensional nature of self-esteem in eating disorders, Bardone et al found that self-competence had the stronger relationship-predicting change in bulimic symptoms in patients with eating disorders, whereas self-worth did not hence indicating that self-liking and self competence were distinct constructs measured by the Rosenberg Self-esteem scale. Although this study provides researchers and clinicians with some good headway for further development and understanding of treatment and diagnosis models for bulimia nervosa in young adults; the model has not been used to evaluate adolescent girls with anorexia nervosa and is limited in

that the bidimensional model of self-esteem is comprised of two constructs that are both global measures, and thus are not domain specific.

To further highlight the benefits of adopting a multidimensional model of the self-concept in mental health research and more specifically eating disorders research, (Ha, Marsh, & Halse, 2004) supported the results of Swift et al (1996) in their study of adolescent anorexia in which the multiple dimensions of the self-concept were evaluated using a single psychometrically sound instrument. Ha et al (2004) showed that different dimensions of the self-concept as measured by the Short version of the Self Description Questionnaire 2 (SDQII-S; Marsh, 1992) were differentially related to eating disorder symptomatology. More specifically, emotional stability, parent relations, same sex relations, physical appearance and general school self-concept and self-esteem were all significantly related to eating disorder symptomatology as measured by the Eating Disorders Inventory-2 (EDI-2; Garner, 1991). Further analysis revealed that girls diagnosed with eating disorders scored significantly lower than girls who had not been diagnosed with anorexia for physical ability, physical appearance, same sex relations, parent relations, emotional stability and general self-esteem, but did not differ from non-clinical girls in terms of their academic self-concepts (general school, math and verbal), opposite sex relations and honesty and trustworthiness.

The current study

As previously highlighted, eating disorders (and more specifically anorexia and bulimia nervosa) are very complex and chronic psychiatric disorders that affect approximately two to three in every 100 Australian females in today's society (CEED & EDFV, 2004). Although many gains have been made in terms of our understanding of the disorder and the factors that are associated with the development and maintenance of the illness, questions still remain about the aetiology of the disorder in adolescent girls in Australia.

Furthermore, although a multitude of research has associated self-esteem with anorexia nervosa, the field has generally adopted a unidimensional approach to the construct, and the well-established multidimensional model of the self-concept is seldom used within the eating disorders field. Hence, the purpose of the present investigation was to address current limitations in the eating disorders field by adopting the multidimensional model of the self-concept, and subsequently evaluate the psychometric properties of the SDQII-S within a clinical sample. This study also employed new structural equation modelling techniques to compare the self-concept differences between a clinical sample of adolescent girls with anorexia and a sample of non-clinical adolescents.

It was expected that the psychometric properties for the SDQII-S for both the clinical and the non-clinical samples would be consistent with the strong psychometric properties found in previous self-concept research. Additionally, it was expected that the multidimensional model of the self-concept, as measured by the SDQII-S would be generalizable to the clinical sample. Furthermore, when comparing the latent mean structures of the self-concept, as low self-esteem and negative body image has consistently been cited as common characteristics of patients with anorexia nervosa, it was hypothesized that the general self-esteem and physical self-concept for the clinical sample would be significantly lower for clinical girls, as compared to non-clinical girls. Additionally, to further highlight the advantage of adopting the multidimensional approach to the self-concept, it is proposed that the academic domains of the self-concept will not be significantly different for the two samples of adolescent girls.

Age and BMI comparisons were also made to determine the effect of these variables on the multiple domains of the self-concept. It was expected that BMI would be significantly related to both general self-concept and physical appearance self-concept because it can be seen as an indicator for physical appearance, but not related to any other of the self-concept

factors. It was expected that age would also negatively affect the various dimensions of the self-concept following the results found by Marsh and Ayotte (2003) who found consistent negative linear effects of age on all dimensions of the self-concept except parental, math and global self-concept for adolescents. However results regarding this effect in the self-concept literature are somewhat inconsistent (mainly due to a paucity of research in the area regarding the multidimensional self-concept), with authors such as Cole, Maxwell, Martin, Peeke, Serocynski, et al (2001) arguing that there is curvilinear relationship between age and self-concept domains.

Methodology

Participants and recruitment

The total sample ($N=989$) comprised of a clinical sample of adolescent girls who had been diagnosed with AN, and a non-clinical sample of female adolescent high school students.

Clinical Participants

The clinical sample of participants comprised of 76 adolescent girls recruited from two Eating Disorder Clinics from the Adolescent Units of two of the largest public hospitals in Sydney, Australia. Clinical participants were aged between 12 and 18 years ($M=14.93$, $SD=1.81$), and had an average Body Mass Index (BMI) of 17.27 kg/m^2 ($SD=2.42$), which is well below the healthy range of BMI for adolescent girls (World Health Organization, 1995). All clinical participants had received a primary medical diagnosis of AN, and were involved in some form of treatment (inpatient or outpatient) with one of the two Eating Disorder clinics. At the time of data collection, 35 of the participants were being treated as inpatients, in which they were being monitored 24 hours a day within the clinical setting, whilst the remaining 46 participants were receiving outpatient treatment (however, data for one of the participants was eliminated for the purposes of this analysis as a result of incomplete responses). After providing informed consent, girls were asked to complete a questionnaire battery during their assessment/consult visit. Administration of the questionnaire battery was done on a one on one basis, in which the researcher sat with the participant while they were completing the questionnaire. In the event that the participant had questions about any of the items within the questionnaire battery, the researcher would answer the questions directly.

Non-clinical participants

The non-clinical sample consisted of 823 female adolescent high school students, recruited from 3 private secondary schools in western Sydney, Australia. Girls were aged between 12 and 19 years ($M=14.08$, $SD=1.59$), and were recruited from years 7 through to 12. Most girls were enrolled in year 9 (accounting for 27.6% of the sample) at school, only 6.5% were in year 12, and were relatively evenly distributed across years 7 (22.8%), 8 (19.4%), 10 (10.5%) and 11 (13.0%). Although this sample of adolescent girls appeared relatively culturally diverse, the majority of the participants were born in Australia (88.7% of the total non-clinical population), however only 42.5% identified themselves as being Australian. The next largest group comprised of Lebanese (7.1% of this sample identifying themselves as Lebanese) followed by Italian (6.2% identified themselves as being Italian). Most of the students in this sample spoke English at home (80.7%). As compared to the clinical sample, whose average BMI was below the healthy range, the non-clinical population had an average BMI within the healthy range for adolescent girls ($M=20.35 \text{ kg/m}^2$, $SD=3.24$).

Instruments

To assess the multiple dimensions of the self-concept of girls with and without anorexia, the Self-Description Questionnaire II: short version (SDQII-S: (Marsh, 1992) was administered. The original version of this questionnaire is a well-developed 102 item

instrument that accurately assesses the multiple and distinct dimensions of the self-concept in different facets of daily activity (Byrne, 1996; Marsh, 1992; Marsh, Byrne, & Shavelson, 1992). The SDQII-S was adapted from the original longer version and retains the original eleven scales, including three areas of academic self-concept, two areas of physical self-concept, three areas of relationship self-concept, and also scales for emotional stability, honesty-trustworthiness and general self-concept. The SDQII-S has 51 items, and employs a 6-point likert scale ranging from true to false. Recent evaluations of this shorter version of the SDQ-II have indicated that the psychometric properties are comparable to that of the original instrument with reliability estimates ranging from 0.80 to 0.90 (see (Marsh, Ellis, Parada, Richards, & Heubeck, 2004). Previous reliability estimates for the scales for the original version of the questionnaire range from Cronbach's $\alpha = 0.78$ for the honesty and trustworthiness scale to 0.89 for the math scale.

Statistical Analyses

Reliability analyses

Based on the responses to individual SDQII-S items, Cronbach's α estimates were calculated to assess the internal consistency of the 11 scales of the SDQII-S for both the clinical and the non-clinical samples independently. According Anastasi and Urbina (1997), a Cronbach's α value of .70 or above is an indicator of acceptable internal consistency amongst the items. Reliability calculations for the SDQII-S for the clinical sample revealed that internal consistency values for each of the scales is well above the acceptable level with Cronbach's α values ranging from .78 (for the honesty and trustworthiness scale) to .93 (for the same sex relations scale). For the non-clinical sample reliability estimates on average were lower than estimates for the clinical sample, however still remained well above the acceptable reliability range as identified by Anastasi and Urbina (1997). Analyses indicated that Cronbach's α values ranged from .79 for the honesty and trustworthiness scale, to .91 for the math scale. See table 1 for Cronbach's α estimates for all SDQII-S scales for both samples of adolescent girls.

Table 1: Internal consistency estimates for the 11 SDQII-S scales for both clinical and non-clinical responses

SDQII-S Scale	Cronbach's α clinical sample (<i>n</i> =75)	Cronbach's α non-clinical sample (<i>n</i> =823)
Physical Ability	.86	.86
Physical Appearance	.91	.87
Opposite Sex Relations	.92	.80
Same Sex Relations	.93	.82
Parent Relations	.87	.85
Honesty and Trustworthiness	.78	.79
Emotional Stability	.86	.82
Math	.93	.91
Verbal	.91	.91
General school	.89	.87
General self-concept	.92	.87

Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM)

For this study, CFA's and SEM were conducted using LISREL 8.54, using the maximum likelihood estimation method. As a consequence of having a small sample size for the clinical sample, individual response items could not be used to assess the factor structure of the SDQII-S. Instead, for the CFA's item parcels were constructed on the basis corrected item total correlations (calculated in the reliability analyses for each of the scales). Hence, for each

latent variable, two indicator parcels were constructed. Several researchers (Hau & Marsh, 2004) have highlighted the advantage of using item pairs in CFA methods, firstly, creating item parcels assists in overcoming the issues that are associated with conducting CFA with sample sizes of less than 100, furthermore, items parcels are less susceptible to idiosyncratic variances, normality and reliability issues compared to individual measurement items.

To indicate good fit between the a-priori factor structure and the data for each of the groups, the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) were evaluated. To indicate reasonable fit between the model and the data, authors (Marsh, Balla, & Hau, 1996) have suggested that TLI values of .90 and above, and RMSEA values of less than .08 are required (values of less than .05 indicate good fit). Additionally, the chi-square test statistic is also reported however little emphasis is placed on these results as in recent years researchers have highlighted the sensitivity of this test statistic to sample size, and thus little emphasis was placed on the chi-square test statistic although it is reported.

Tests of invariance across multiple groups

Generally, to determine whether the same instrument can be used in different populations, multigroup tests of invariance can be conducted to assess whether the a-priori factor structures are the same between sample groups (Byrne, 1998). Tests of factorial invariance traditionally consist of a series of 4 different CFA models, in which gradually increasingly stringent invariance constraints are placed on the model. The first of the series of models is the least stringent in which there are no equality constraints placed on the model (completely free). The second is slightly more restricted in that the factor loadings are held invariant between the two groups. The third is again slightly more restricted in comparison to the second model, where the factor variances and covariances are also constrained to be equal between the groups. The fourth model is the most stringent, in that all parameters are held invariant between the groups. For the purposes of this study, factorial invariance was assessed between the clinical and the non-clinical samples. To assess factorial invariance, if the introduction of more equality constraints leads to little or no change in the goodness of fit indices (RMSEA, TLI and RNI), then there is good support for the invariance of the factor structure between the sample groups. However, if the introduction invariance constraints results in a decrease in the model fit indices, then there is evidence for variance between factor structures for each of the groups being assessed.

Multiple Indicator multiple indicator cause (MIMIC) models

The MIMIC model approach employed in this study is a technique that is similar to that of multiple regression, in that it is a method that enables researchers to determine which latent variables can be predicted by distinct observed variables represented by a single indicator (in the case of this study, demographic variables such as age, BMI, and diagnosis group). The benefit of employing MIMIC models as opposed to traditional MANOVA and multiple regression techniques is that rather than relying on scale scores (which are measured with error), the analysis is conducted on the basis of the underlying factor structure and thus measured without error. Additional benefits of the MIMIC model technique are that it is able to deal with smaller sample sizes, in which stable variances and covariances cannot typically be estimated, and that it is more flexible in comparison to MANOVA approaches, in that it is able to handle both discrete and continuous variables, and the interactions between these independent variables.

For this study, the MIMIC model further evaluated the factor and construct validity of the SDQII-S by determining the effect of age, BMI and diagnosis group (1=clinical, 2=non clinical) on each of the latent variables. Additionally, interaction terms for the model were zero-centred, as recommended by Aiken & West (1991).

Results and Discussion

Descriptive statistics

The descriptive statistics for the two samples in terms of age, BMI and self-concept scale scores are presented in table 2.

Table 2: Descriptive statistics for scale scores

Variable	Sample	Mean	Standard Deviation
Age (years)	Total	14.15	1.62
	Clinical	14.93	1.81
	Non-clinical	14.08	1.59
BMI (kg/m ²)	Total	20.09	3.29
	Clinical	17.27	2.42
	Non-clinical	20.35	3.24
Physical Ability	Total	4.36	1.31
	Clinical	4.39	1.25
	Non-clinical	4.36	1.31
Physical Appearance	Total	3.77	1.38
	Clinical	3.05	1.46
	Non-clinical	3.83	1.36
Opposite Sex	Total	4.39	1.20
	Clinical	4.26	1.46
	Non-clinical	4.40	1.17
Same sex	Total	5.09	0.97
	Clinical	4.88	1.24
	Non-clinical	5.11	0.94
Parent relations	Total	4.73	1.26
	Clinical	4.45	1.32
	Non-clinical	4.75	1.25
Honesty and trustworthiness	Total	4.57	0.95
	Clinical	4.68	0.92
	Non-clinical	4.56	0.95
Emotional stability	Total	3.60	1.27
	Clinical	2.91	1.34
	Non-clinical	3.67	1.24
Math	Total	3.42	1.55
	Clinical	3.79	1.62
	Non-clinical	3.39	1.54
Verbal	Total	4.05	1.39
	Clinical	4.21	1.36
	Non-clinical	4.03	1.39

General School	Total	4.25	1.28
	Clinical	4.59	1.25
	Non-clinical	4.21	1.27
General self-concept	Total	4.53	1.11
	Clinical	4.00	1.43
	Non-clinical	4.58	1.07

Factor Structure and Multidimensionality of the self-concept

Total sample factor structure

The results for the total sample CFA indicated that there was a good fit between the response data and the a priori 11-factor self-concept model that the SDQII-S assesses. Goodness of fit between the data and the a priori model was indicated by high factor loadings for the measured indicators, in which all factor loadings for each of the measured indicators were consistently high for the factors in which each of the indicators were designed to measure (see table 3), and goodness of fit indices well within the accepted level ($\chi^2= 2936.52$, $df= 1169$, $TLI=.98$, $CFI=.98$, $RMSEA= 0.041$).

Table 3: Factor Loadings, correlations between factors and effect of age, BMI and diagnosis group

Variable	PAb	PApp	OppSex	Ssex	Parrel	H-T	ES	Math	Verb	Gsch	GSC
1	.80	.86	.88	.67	.84	.42	.68	.83	.70	.76	.77
2	.95	.94	.50	.79	.77	.64	.65	.79	.80	.75	.81
3	.71	.71	.74	.66	.71	.64	.66	.89	.84	.87	.83
4	.69	.72	.82	.71	.78	.79	.68	.88	.91	.83	.73
5				.74		.55	.83		.85		.62
6						.72					.70

Self-Concept Factor Correlations ^a											
PhysAb	1.00										
PhysApp	.35	1.00									
OppSex	.38	.32	1.00								
Ssex	.33	.33	.37	1.00							
Parrel	.24	.38	.08	.29	1.00						
H-T	.14	.18	.09	.24	.49	1.00					
ES	.27	.42	.32	.43	.32	.24	1.00				
Math	.14	.28	.03	.20	.25	.21	.15	1.00			
Verb	.11	.22	.09	.26	.24	.24	.15	.21	1.00		
GSch	.28	.41	.15	.35	.48	.39	.25	.65	.63	1.00	
GSC	.40	.69	.25	.47	.62	.38	.47	.45	.44	.77	1.00

Effects of Age, BMI, Diagnosis Group and interaction terms ^b											
Age	-.18*	-.13*	-.07*	-.15*	-.20*	-.03	-.19*	-.17*	-.14*	-.19*	-.19*
BMI	-.02	-.06	-.01	.02	-.00	.03	.01	-.02	.03	-.02	-.04
Diag Grp	-.03	.16*	.04	.05	.04	-.06	.15*	-.09*	-.06	-.11*	.13*
riagxbmi	-.06	.02	-.05	-.03	.07	-.01	.02	.04	.03	.05	.04
ibmixgrp	.03	.00	-.00	-.02	.01	.03	.01	-.05	.01	-.02	.03

^a All correlations between self-concept factors are significant at $p < .05$

^b As the factor structure for the 11 self-concept factors is the same as that presented for the total group CFA, only the Completely standardised Beta Coefficients (path coefficients) for the contrast variables are presented here.

For the total sample CFA, correlations between factors revealed an interesting pattern of results (see table 3). As the general self-concept factor was designed as an overarching construct in which all factors could be incorporated, it was expected that it would be most correlated with the other factors of the SDQII-S. Results indicated that this was the case, with general self-concept being most correlated with general school self-concept ($r = .77$). This result is not surprising as adolescence is a developmental period in which most individuals begin to define themselves through their academic environment and experiences; this is presumably because they spend most of their time within the school environment. Additionally, results indicated that Physical appearance was also closely associated with general self-concept ($r = .69$) supporting much of the literature in the field that suggests that during adolescence, physical appearance plays a major role in the way that individuals evaluate themselves, particularly for girls.

Factorial Invariance of the self-concept over clinical and non-clinical adolescents

One of the major objectives of this study was to determine the generalizability of the multidimensional model of the self-concept, and thus to determine whether the 11 factor a priori model of the self-concept could be applied to both the non-clinical and the clinical samples of adolescent girls. This process involved the assessment of a series of models using CFA techniques in which increasingly restrictive invariance constraints are placed on the model. Four different invariance models were tested, the first, was a model in which there were no invariance constraints, the second involved holding the factor loadings invariant, the third involved constraining the factor loadings, factor variances and covariances to be equal, and the final and most restrictive model involved completely constraining all parameter estimates. As a result of the small sample size in the clinical sample, item parcels were constructed, so as to reduce the number of parameters that needed to be estimated in the CFA. Each factor was therefore measured by two parcelled indicator variables.

Results of this series of invariance tests revealed that despite the size of the sample, there is very strong support for the structural invariance of the SDQII-S across two different samples of adolescent girls, particularly because the most restrictive model of invariance provided the best fit between the data and the a priori model (see table 4). These results thus suggest that the self-concepts of girls both with and without anorexia nervosa are multidimensional, and that the SDQII-S is an instrument that is able to assess the 11 facets of the self-concept.

This is an important finding because although the SDQII-S is an instrument that has been extensively utilised within the educational sector to reliably assess the multiple facets of self-concept in adolescents, it has not been used within the mental health sector in which the self-concept has been identified as an important construct in both the development and maintenance of psychological and psychiatric issues, particularly for adolescents. Traditionally, clinicians in the area have employed a unidimensional approach to examining the self-concept, and thus when designing treatment programs to enhance the self-concept, they have developed programs that target the overall sense of self rather than the individual facets. This approach to self-concept enhancement however has been shown to be somewhat inefficient, in that the effect sizes in programs that address specific facets of the self-concept rather than the general construct are significantly larger. This result provides very strong support for the multidimensional nature of the self-concept and also highlights the importance of evaluating the different facets of the self-concept, and developing enhancement programs that address the specific domains of the self-concept rather than the general construct (O'Mara, Marsh, & Craven 2004).

Table 4: Tests of Factorial Invariance across clinical and non-clinical samples

Model	χ^2	DF	TLI	CFI	RMSEA	(90% CI)
Completely free	729.23	330	.97	.98	.0498	(.045- .055)
Invariant factor loadings	729.23	330	.97	.98	.0498	(.045- .055)
Invariant Factor loadings, Factor variances and Covariances	849.73	396	.98	.98	.050	(.047- .056)
Completely invariant	884.17	418	.98	.99	.049	(.044- .053)

The Effect of Age, Diagnosis group and BMI on the multiple dimensions of the self-concept

A MIMIC (structural equation path) model was tested to determine the effects of age, BMI and diagnosis on the 11 different facets of the self-concept. Additionally, the effects of cross product interaction terms were evaluated in this extended model (cross product of age and bmi (iagxbmi) and the interaction of bmi and group (ibmixgrp). As the path coefficients and the self-concept latent variables are the same as those for the total sample CFA, for this analysis, greater emphasis is placed on the path coefficients (beta coefficients), which are representative of the effect of age, BMI and diagnosis group (see table 3). Goodness of fit indices indicated that there was a good fit ($\chi^2= 3139.54$, $df=1289$, $TLI= .97$, $CFI=.98$, $RMSEA= 0.040$).

Effects of diagnosis group: Does being anorexic make a difference?

The results of the MIMIC model demonstrated that whether or not girls were anorexic did significantly affect various dimensions of the self-concept, but not all aspects of the self-concept (see table 3). This result provides very strong support for the multidimensionality of the self-concept and the benefits of adopting such an instrument for the evaluation of the self, particularly in mental health.

More specifically, the results indicated that as expected, girls in the non-clinical sample scored significantly higher on the physical appearance scale as compared to the clinical sample of adolescents with anorexia nervosa. Containing items such as 'I have a good looking body' and 'I have a nice looking face' high scores on this scale indicate that respondents agree with these statements and thus have positive evaluations of their physical appearance. Furthermore, the effect of diagnosis group on physical appearance remained even after controlling for the possible effects of BMI. This result, although not a primary objective of this study, is not surprising as much of the literature about patients with anorexia suggests that they have an intense fear of fatness, and that they have chronic body image disturbance in comparison to their non-eating disordered peers (see for example: Ha et al, 2004). In addition this result is also consistent with the diagnostic criterion for anorexia, which includes body image dissatisfaction, and a drive for thinness (APA, 2000).

The results of the MIMIC model also indicate that non-clinical girls scored higher than clinical girls for emotional stability, and that the effect of group on emotional stability remained even after controlling for the effects of age and BMI. This result is also not surprising, as many of the items within this scale target emotions, and confusion about emotional states. It is not uncommon for sufferers of anorexia nervosa to suffer from

confusion about their emotions, particularly when they are receiving treatment for a disorder that they might be in denial about having. Additionally, as a result of malnutrition, anorexia sufferers tend to experience many mood fluctuations that they may not necessarily understand, or know how to control (Garner, 1991).

Interestingly, scores for two out of three academic self-concept facets (Math and general school self-concept) were shown to be higher for girls with anorexia nervosa, as compared to adolescent girls without anorexia nervosa, and furthermore, the effect of group was significant for these two academic scales even when the effects of age and BMI are controlled for. Although previous studies have shown that girls with anorexia nervosa have scored highly on academic related adjustment (Swift et al, 1996) and self-concept (Ha et al, 2004) in comparison to non-clinical peers, it is fascinating because the higher results were not consistent across all of the domains of the academic self-concept, as group did not have a significant effect on verbal self-concept.

Much of the literature within the eating disorders field has argued that girls with anorexia nervosa and other eating disorders have low self-esteem; the results of this study also suggest that this is the case. The MIMIC model indicated that the effect of group on self-esteem (or general self-concept) was substantial, even when the effects of age and BMI were controlled. Closer examination of the results indicates that the non-clinical sample of girls generally had a positive evaluation of themselves, thus supporting much of the eating disorder literature.

For all other aspects of the self-concept however, the results indicated that there was no significant effect of group membership on social relations (same sex peers, opposite sex peers and parental relations). This result is somewhat surprising, as some authors have suggested that anorexia nervosa effects social interaction, with many patients becoming increasingly socially withdrawn as the pathology of the disorder increases (Swift et al., 1986).

These are important findings, as clinicians, and school counsellors who often have to treat adolescents with anorexia nervosa and other eating disorders, tend to employ strategies that target the overall self-concept rather than individual facets of the self-concept. Perhaps this is an ineffective technique for the treatment of eating disorders as these results clearly suggest that girls with anorexia nervosa do not necessarily have deficits in all aspects of their self-concepts. Perhaps if counsellors and clinicians adopted the multidimensional model of the self-concept, they would be able to determine the specific areas in which deficits exist for girls with eating disorders, and thus develop treatment and enhancement programs to target these areas, in particular, areas such as physical appearance and emotional stability.

Effects of Age on Self-concept

Although many authors (eg (Marsh, 1989; Wylie, 1979) have argued that there is a curvilinear effect of age on global self-esteem, there have been very few studies that have examined the impact of age on the varying dimensions of the self-concept. The results of the analysis of age and self-concept domains for this study revealed that age significantly affected all domains of the self-concept except honesty and trustworthiness. The results indicate that, as girls get older, their perception relating to most areas of themselves become more negative. This result supports that of Marsh and Ayotte (2003) as they also found that there was a consistent negative association between age and the different domains of the self-concept.

Effects of BMI on Dimensions of the Self-concept

The effect of BMI on the multiple domains of the self-concept was shown to be non-significant for all domains except for the general self-esteem, in which the effect was negative. That is, the results indicated that as girls' BMI increased, their self-esteem became more negative. This result could be explained by the fact that body image plays a large role in

the general perception of the self (as shown by the high inter factor correlation between physical appearance and general self). Additionally, BMI is a ratio of both height and weight could be seen as an indicator of physical self and appearance and thus may explain why there is a significantly negative effect. Although this assertion seems intuitively appealing, the data revealed that the effect of BMI on physical appearance was not shown to be significant at a linear level. However, post hoc regression analysis revealed that the association between BMI and physical appearance was significantly curvilinear ($F_{(895)} = 3.21, p = 0.04$), suggesting that as BMI tended toward 20 kg/m² physical appearance self-concept was most positive, but when BMI was low or high, physical appearance evaluations became more negative. This result thus indicates that physical appearance self-concept is most positive when body weight is within the normal and healthy range.

Interaction effects (of Age x BMI and BMI x Group) on self-concept domains

The results of the MIMIC model analysis revealed that there were no significant interaction effects for age and BMI on self-concept, and thus, that the much of the variance in self-concept domains can be explained by the main effects of age and group. However, when the MIMIC model was extended to include the interaction terms, the significant effect between BMI and general self-esteem was lost (main effect). Despite this change, the significance of the effect of group and age on self-concept remained the same after the introduction of the interaction terms. Thus, as the goodness of fit indices for both of the samples are much the same for the two MIMIC models, only the main effects model was presented in this paper.

Summary and Implications

A persistent difficulty in researching populations that have special characteristics is that researchers assume that instruments that are developed and psychometrically tested with normal general populations are appropriate for use with clinical populations and other special populations (Marsh, Tracey, & Craven, in review; Wylie, 1979). As a result of this assumption, many researchers have attempted to generalise the use of measures, such as self-concept instruments, to clinical populations, which have thus led to inconsistent and inconclusive results. This study therefore attempted to determine the generalizability of the multidimensional model of the self-concept, and the validity of the SDQII-S in both non-clinical and clinical adolescent girls. The result of the CFA's conducted in this study, offer strong support for the multidimensional model of the self-concept in a clinical sample of adolescent girls, despite the small sample size. Whereas clinicians in the mental health sector have associated a low self-esteem with eating disorders and other mental health issues, researchers have typically adopted the unidimensional approach for both diagnosis and treatment of these disorders.

This study thus highlights that girls both with and without anorexia nervosa actually have differing perceptions of themselves depending on what they are evaluating themselves on (physical, academic, social, emotional or general). Hence, although many studies have been able to associate the low self-esteem with anorexia these results highlight that there are some facets of the self that girls with anorexia actually evaluate themselves more positively than their non-eating disordered peers. Furthermore, there also appears to be areas of the self that girls with anorexia do not differ from their non-clinical peers. More specifically, it appears that anorexia has a significant negative effect on physical appearance, emotional stability, and self-esteem. Group also had a significantly positive effect on math self-concept, and general school self-concept, whereas in other domains, they do not differ from their non-clinical peers. Hence these results lend support for the use of the multidimensional model of the self-concept.

As positive self-esteem has many desired outcomes for both health and education it is a construct that schools, teachers and clinicians are already targeting in health promotion programs for adolescents and students, and hence a more in depth understanding of its' association with eating disorders is vital. As educational institutions have a great deal of contact with the population that is most at risk of anorexia nervosa, it is imperative that educators and school counsellors in Australia and around the world understand Anorexia Nervosa, and the factors that may influence the onset and development of the disorder. Schools and teachers are in a uniquely strong position to be able to develop and maintain prevention strategies and educate their students about issues relating to eating disorders, coping strategies, and the importance of healthy development (physical, emotional and psychological).

This study therefore emphasizes and highlights the areas of the self-concept that may need to be targeted when designing positive health and psychological development for adolescents within the school setting. Additionally, these results help inform educators and health professionals about the deficits that do exist in the self-concept for girls with anorexia nervosa, and thus instead of targeting just the self-esteem for enhancement, perhaps clinicians need to also consider other areas of the self such as physical appearance, and emotional stability.

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