

THE LONG-TERM IMPACT OF AN EATING DISORDER PREVENTION
PROGRAM FOR ELITE ATHLETES: A FOLLOW-UP STUDY

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The Long-Term Impact of an Eating Disorder Prevention Program for Elite Athletes:

A Follow-Up Study

Master of Arts 2015

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Abstract

Elite athletes involved in weight-based sports are at increased risk of developing eating disorders (EDs). While the utility of ED prevention programs has been assessed up to three years post-intervention, it is unclear whether participation in such interventions promotes any resilience against EDs in the long-term. To address this, the current study assessed self-reported disordered eating and body dissatisfaction in ballet dancers 15 or more years after participating in a reportedly successful ED prevention program at a professional ballet school. Graduates of the school before, during, and after the intervention were surveyed, and scores were compared across groups. Results revealed dancers who participated in the intervention and those who attended post-intervention endorsed fewer thoughts and behaviours associated with bulimia, had lower lifetime prevalence of laxative use, and showed a trend toward lower lifetime rates of vomiting to control weight than those who attended the ballet school prior to the intervention.

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1. INTRODUCTION

Study's Objective

Rational: The utility of eating disorder (ED) prevention programs has been explored in the literature (Stice & Shaw 2004; Stice, Shaw, & Marti, 2007). Specifically, interactive programs directed at higher risk populations demonstrate promise as a method to avoid the development of symptoms associated with EDs (Stice et al., 2007). That being said, while some studies have conducted six-month or one-year follow-ups to consider the long-term effects of prevention programs, no studies have considered the long-term impact (greater than three years) of these programs on participants' experiences of their bodies and/or eating.

One group that has consistently been identified as being at higher risk for developing EDs is elite athletes involved in sports that attach some type of value to weight and/or shape (Krentz & Warschburger, 2011; Smolak, Murnen, & Ruble, 2000; Sundgot-Borgen & Torstveit, 2004; Torstveit, Rosenvinge, & Sundgot-Borgen, 2008). While these higher risk sports have been conceptualized in a variety of ways in the literature (e.g., aesthetic, weight-class, and gravitational sports), all of them posit some type of value to the weight and/or the physical shape of an athlete, and consequently appear to increase the risk of developing ED symptoms. Although only a handful of published studies have examined ED prevention programs specifically in athletes, there is clearly a need to better understand the long-term effects of ED prevention programs amongst this population given the clear presence of increased risk.

Purpose: The purpose of the present study was to examine if prevention initiatives can effectively lower the lifetime prevalence of ED symptomatology amongst

elite athletes. Specifically, this study sought to investigate the long-term utility of an ED prevention program in a high-risk group of athletes 15 or more years after participating in a reportedly successful prevention program (Piran, 1999).

Literature Review

A. Eating Disorders and their Prevalence

Eating disorders (EDs) are characterized as serious disturbances in eating behaviors (APA, 2013). The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) categorizes EDs into several specific types, including: anorexia nervosa (AN), bulimia nervosa (BN), binge eating disorder (BED) and other specified feeding or eating disorder (OSFED; APA, 2013). Diagnostic features of AN include restriction of energy intake leading to significantly low body weight for age, sex, developmental trajectory and physical health, an intense fear of gaining weight, and disturbances in the way in which one's body weight or shape are experienced (APA, 2013). Diagnostic features of BN include recurrent episodes of binge eating, inappropriate compensatory behaviors to avoid weight gain (e.g., self-induced vomiting, laxatives, excessive exercise), and self-evaluation disproportionately linked to body shape and weight (APA, 2013). Features of BED include recurrent episodes of binge eating, marked distress associated with binge eating, and a lack of recurrent use of inappropriate compensatory behaviors. A diagnosis of OSFED is provided in clear cases of EDs that do not meet the full criteria for a specific feeding or eating disorder (APA, 2013). EDs are associated with physical disturbances, such as permanent loss of bone mineral density, and psychological distress, including depressed mood (APA, 2013). As well, EDs have a higher mortality rate than any other

mental disorder (Arcelus, Mitchell, Wales, & Nielsen, 2011; Nielsen et al., 1998; Sullivan, 1995).

EDs typically begin in adolescence and are 10 times more likely to occur in females than males (APA, 2013). Using what were at the time “proposed” DSM-5 criteria, Stice, Marti, and Rohde (2013) found that in a sample of 496 females, tracked for eight years, the lifetime prevalence by age 20 was 0.8% for AN, 2.6% for BN, and 2.8% for BED. OSFED prevalence was the highest at 11.5%. In a larger study, using the DSM-IV (APA, 1994) criteria and the Eating Disorder Examination questionnaire and interview, Machado, Machado, Gonçalves, and Hoek (2007) sampled 2028 female students (aged 12-23) in Portugal and found 0.4% had AN, 0.3% had BN, and 2.4% had some form of eating disorder not otherwise specified (previous diagnosis replaced by OSFED).

While the general prevalence of EDs may not seem particularly high in absolute terms, they are still very concerning given their high rate of mortality (Arcelus, Wales, & Nielsen, 2011; Crow et al., 2009; Herzog et al., 2000), most notably resulting from suicide (Pompili, Mancinelli, Girardi, Ruberto, & Tartarelli, 2004). Hoek and Hoeken (2003) pointed out that the stringent diagnostic criteria of DSM-IV (APA, 1994) may have perpetually lead to underestimations of the true prevalence of these disorders, and suggest that especially for certain sub-groups of the population rates of EDs may be higher than those found in the general population.

B. Eating Disorders in Athlete Populations

Risk and Prevalence

The question of whether participation in sport increases the risk of developing an

ED has long been contested in the literature. Participation in regular physical activity is generally thought to be associated with greater body satisfaction (e.g., Malinauskas, Cuchiarra, & Bruening, 2005; Wilkins, Boland, & Albinson, 1991). However, both male and female athletes at the collegiate and elite level experience disordered eating at higher rates than non-athletes (Petrie & Greenleaf, 2011). For example, up to 70% of elite athletes competing in weight class sports engage in dieting as well as other physiologically risky behaviours (e.g., laxative abuse) to lose weight for competition (Oppliger, Case, Horswill, Landry, & Shelter, 1996; Torstveit & Sundgot-Borgen, 2005). Disordered eating broadly refers to maladaptive eating behaviors (Bonci et al., 2008), and has been conceptualized on a continuum from dieting to clinical EDs (Sundgot-Borgen & Torstveit, 2010). Together with body dissatisfaction, conceptualized as poor subjective evaluation of one's body (Sonnevile et al., 2012; Lloyd-Richardson, King, Forsyth, & Clark, 2000), these qualities are thought to increase vulnerability for the development of an ED. Thus, although participation in regular physical activity has been typically associated with greater body satisfaction (e.g., Malinauskas, Cuchiarra, & Bruening, 2005; Wilkins, Boland, & Albinson, 1991), the findings above suggest that the effect of involvement in sport is not linear.

While some components of sport activity may actually protect against the development of EDs, others appear to increase the risk. Specifically, athletes participating at the elite level and those involved in weight-based or lean focused sports have been found to be at increased risk of developing an ED (Krentz & Warschburger, 2011; Smolak, Murnen, & Ruble, 2000; Sundgot-Borgen & Torstveit, 2004; Torstveit, Rosenvinge, & Sundgot-Borgen, 2008). Additionally, if a large majority of weight class

athletes engage in such behaviours, these behaviours may be seen by the sport world as somewhat acceptable, if not adaptive, to winning. This makes diagnosing EDs in athletes a particular challenge, as clinicians must determine, for example, what constitutes an “excessive” amount of exercise for an elite athlete.

Smolak and colleagues (2000) conducted a meta-analysis examining the effects of female involvement in sport. While the results of this meta-analysis did not provide clear evidence to suggest that the athletes were at increased risk of developing an ED, there were significant sub-groups of athletes that did appear to be at greater risk. In particular, elite athletes (defined in the study as athletes successfully competing at the national, international, or professional level), participating in lean sports (defined in the study as sports that include a focus on appearance), appeared to be at higher risk of developing an ED than non-athletes (Smolak et al., 2000).

In the largest published study examining the prevalence rates of EDs in athletes, Sundgot-Borgen and Torstveit (2004) compared 1620 elite athletes to 1696 non-athlete, age-matched controls. Results revealed that 4.6% of non-athlete controls and 13.5% of elite athletes had either a clinical or subclinical ED, suggesting there is a significantly higher prevalence of EDs amongst elite athletes than the general population (Sundgot-Borgen & Torstveit, 2004). When considering gender, results of this study found that female elite athletes were twice as likely as female non-athletes, and male elite athletes were a staggering 16 times more likely than male non-athletes, to develop clinical or subclinical EDs¹ (Sundgot-Borgen & Torstveit, 2004). However, similar to the findings of Smolak and colleagues (2000), sports emphasizing weight or shape appeared to be putting the athletes at higher risk.

¹ Subclinical eating disorders were defined as either Eating Disorder Not Otherwise Specified (as

More recent studies have echoed these findings. Torstveit, Rosenvinge, and Sundgot-Borgen (2008) conducted clinical interviews with 186 national level athletes and 145 non-athlete controls. While the study found no significant difference in the percentage of athletes and controls with EDs, a higher prevalence of EDs was found in athletes competing in sports emphasizing leanness than non-leanness based sports or the controls. Similarly, Krentz and Warschburger (2011) compared elite athletes from aesthetic sports (i.e. sports emphasizing leanness) with non-athletes and found that while self-reported body dissatisfaction did not differ between the groups, the athletes reported more ED symptoms. Together, these results suggest that while involvement in sport may sometimes improve body satisfaction, involvement in certain sports, particularly at the elite level, may put athletes at higher risk of developing symptoms associated with EDs.

Defining High Risk Sport

The high-risk sports discussed above have been conceptualized in the literature in a variety of different ways; however, broadly, they are considered weight sensitive-sports. Three specific classifications appear to most succinctly describe the spectrum (Ackland et al., 2012; Sundgot-Borgen, 2013):

(1) *Aesthetic sports* are those in which physical appearance is a fundamental component of judging criteria. These include sports such as gymnastics, figure skating, and dance, which typically value and reward thin, long-lines. Although it is assumed that males might feel similar pressures, the bulk of the research in aesthetic sports has targeted females. This research has shown that athletes involved in aesthetic sports have elevations on drive for thinness, bulimia features, dieting behavior and weight and shape concerns relative to non-athletes (Van Durme, Goosens, & Braet, 2011).

(2) *Weight class sports* are those in which athletes' weight determines the category in which they will compete. These include sports such as judo, wrestling, and boxing. One study examining a large group of wrestlers ($N = 2532$) found that 72% engaged in at least one harmful weight loss method each week of the wrestling season (Kinningham & Gorenflo, 2001). In addition to engaging in rapid weight loss methods, this subgroup of wrestlers also engaged in more binge eating behavior (Kinningham & Gorenflo, 2001).

(3) *Gravitational sports* are those in which low body weight may improve performance. This category includes sports such as running, cycling, swimming, and horse racing. Highlighting the elevated risk of EDs in this group, top female middle and long-distance runners have been shown to have higher rates of AN and non-specified eating disorder symptomatology than the general population (Hulley & Hill, 2001). The demand for leanness in the sport was cited as the main risk factor in this group (Hulley & Hill, 2001).

Evidently, although EDs can and do occur in athletes involved in low risk sports such as basketball or football, the above categories represent the types of sports that appear to put an athlete at higher risk of developing an ED than those involved in low-risk sports or non-athletes. Intuitively, the unique pressures of these sports are what appear to increase the risk for those involved and determine the unique characteristics of EDs among these athletes.

Unique Characteristics of Eating Disorders in Athletes

Depending on the type of high-risk sport an athlete is involved in, different types of weight loss methods may be employed. For example, weight division sports may

encourage rapid forms of weight loss as a result of required weigh-ins that determine an athlete's competition category (Dosil, 2008). These methods include excessive running, saunas, and wearing vapour-impermeable clothing before a weigh-in (Alderman, Landers, Carlson, & Scott, 2004). While these methods may temporarily aid an athlete in reaching a weight requirement, Yoshioka and colleagues (2006) found that rapid weight reduction significantly affected athletes' mood and has potential negative effects on competition performance. Similarly, Degoutte and colleagues (2006) demonstrated that the combination of energy restriction and increased exercise that facilitates rapid weight reduction before competition negatively affects both the physiological and psychological state of athletes, potentially impairing competition performance. These findings highlight the notion that even if athletes with EDs are able to stave off serious morbidity, their athletic performance is clearly compromised by the use of these dangerous weight loss methods (Currie, 2010).

In other high risk sports, such as aesthetic and gravitational sports, the goal is often to maintain low weight for long periods of time, as opposed to rapid weight-loss. This goal encourages weight control more often through calorie restriction than methods such as saunas and laxatives that only temporarily change scale weight through dehydration (Dosil, 2008). The consequences of this type of chronic restrictive eating and intensive physical training often leads to long-term physical damage, including damage to the neurological and hormonal development of young athletes (Patel, Pratt, & Phillips, 2003).

In addition to clinical EDs, athletes are also at risk of developing a syndrome now referred to as Relative Energy Deficiency in Sport (RED-S; Mountjoy et al., 2014). The

International Olympic Committee recently replaced Female Athlete Triad (FAT) with RED-S to more accurately capture the cluster of symptoms that both female and male athletes are at risk of developing as a result of an imbalance of energy expenditure versus energy intake. RED-S symptoms include (but are not limited to) impaired metabolic rate, menstrual function, bone health, immunity, protein synthesis, and cardiovascular health (Mountjoy et al., 2014). Disordered eating may account for a large majority of RED-S cases, however, mismanaged energy intake and expenditure may also be a cause (Loucks, 2004).

Also noteworthy when considering EDs in athletes is that beyond pressure from themselves and often their parents, athletes are commonly influenced to lose weight by comments or instruction from their coaches (Heffner, Ogles, Gold, Marsden, & Johnson, 2003; Kerr, Berman, & De Souza, 2006). Understanding the role of the coach in an athlete's ED is therefore relevant when attempting to understand the unique manifestation of EDs in athletes, as well as when considering treatment options for this population (Heffner et al., 2003).

Treatment of Eating Disorders

Theoretical models of ED development consider biological, psychological, and social factors, as well as their interactions. Treatment of EDs in the general population will vary depending on the theoretical model being employed, and the specific diagnosis and age of an individual. For BN and some forms of OSFED cognitive behavioral therapy (CBT), based on Fairburn, Marcus, and Wilson's (1993) cognitive model of maintenance mechanisms, has been shown to be the most effective form of treatment (Wilson, Grilo, & Vitousek, 2007). While CBT may also be applied to AN, its success rate has been only

marginal (Wilson et al., 2007). Family therapy is recommended in younger individuals with AN, and has been shown to be effective in this sub-group (NICE, 2004; Wilson et al., 2007). That being said, treatment of EDs is largely ineffective for almost half of individuals with EDs (Becker, McDaniel, Bull, Powell, & McIntyre, 2012; Fairburn, 2005; Fairburn et al., 1995; Geller & Dunn, 2011).

While similar treatment techniques are applied to athletes with EDs, the unique circumstances that may initiate the development of an ED in this special population must also be addressed (Sherman & Thompson, 2001; Thompson & Sherman, 2010). Often athletes will consider pathological weight loss methods and eating behaviours to be necessary and even normal within their sport (Sherman & Thompson, 2001; Thompson & Sherman, 2010). This type of belief often further complicates attempts to treat EDs in athletes (Dosil, 2008). In some cases, not allowing athletes to train until they agree to meet certain treatment criteria may prove effective in motivating athletes to engage in treatment (Thompson & Sherman, 2010). However, just as in the general population, no treatment for EDs has proven to be particularly effective in athletes (Becker et al., 2012). As a result, prevention initiatives have been receiving increasing attention (Becker et al., 2012).

C. Prevention of Eating Disorders

The Committee on the Prevention of Mental Disorders, a branch of the American Institute of Medicine, defines prevention as “interventions that occur before the initial onset of a clinically diagnosable disorder” (Muñoz, Mrazek, & Haggerty, 1996, p. 1118). They recommend researchers conceptualize prevention studies as either universal, selective, or indicated (Muñoz, Mrazek, & Haggerty, 1996). Universal prevention

interventions aim to target the general population, selective prevention interventions aim to target those at greater than average risk for mental disorder, and indicated prevention interventions aim to target high-risk individuals (e.g., those with predisposing biological markers or detectable symptoms of a mental disorder that do not yet meet diagnostic criteria; Muñoz, Mrazek, & Haggerty, 1996).

Over the last two decades, several studies specifically focusing on ED prevention programs have been conducted to better understand their effectiveness. These studies have yielded somewhat mixed results. For example, Paxton (1993) implemented a five-session group program for female high-school students. This universal prevention program was primarily didactic; however, participants were also encouraged to discuss the information being taught. Although the program improved participants' knowledge about issues related to EDs, participants' patterns of disordered eating and frequency of extreme weight loss behaviors were unchanged when assessed one year following the program (Paxton, 1993). Several other school-based universal prevention attempts have reported similarly limited results (e.g., Moreno & Thelen, 1993; Smolak & Levine, 1996). In contrast, one school-based universal prevention program conducted over eight-sessions reported positive behavioral changes, particularly decreased levels of dietary restraint, following the program; however, these positive changes had essentially disappeared by the six-month follow-up (Carter, Stewart, Dunn, & Fairburn, 1997).

Stice and Shaw (2004) conducted a meta-analytic review of ED prevention programs, and discovered that all programs that reduced current or future ED symptoms used interactive as opposed to didactic approaches. These programs included interactive exercises focusing on risk factors for eating pathology (e.g., body dissatisfaction) and

discussions of the social pressures of thinness and weight control. The utility of the interactive approaches found by Stice and Shaw (2004) was consistent with a meta-analysis of substance abuse prevention programs that similarly found interactive programs to be the most effective approach (Tobler et al., 2000). Collectively, these studies suggest that engagement and interaction with participants is required in order for prevention programs to have any significant lasting effects.

In a subsequent meta-analysis, Stice and colleagues (2007) reviewed 68 controlled trials of ED prevention programs conducted between 1980 and 2006. They found that 51% of the ED prevention programs reviewed were effective in reducing some of the risk factors associated with EDs. These included body dissatisfaction, dieting, thin-ideal internalization, negative affect, and/or disordered eating. However, only 29% of the prevention programs examined reduced current or future eating pathology, defined as threshold or subthreshold EDs. Larger effects were found for selective versus universal prevention approaches, interactive versus didactic approaches, and multi-session versus single-session prevention programs (Stice, et al., 2007). In addition, gender-matched programs, programs targeting participants over age 15, and programs facilitated by external professionals (versus someone familiar to participants) also exhibited larger effects (Stice et al., 2007).

Prevention of Eating Disorders in Athletes

The meta-analytic findings described above provide promising and important directions for the development of ED prevention programs. Notably, the strong support that has been found for selective versus universal prevention programs suggests that targeting higher risk populations (e.g., athletes) could prove to be an effective and cost-

efficient prevention strategy. Along with research of universal prevention programs for EDs, research into selective prevention programs for higher risk populations therefore should also be considered. However, although one might expect that athletes who are believed to be at greater than average risk of developing EDs would be an informative population to consider, to date only 11 ED prevention programs for athletes appear to have been studied (Bar, Cassin, & Dionne, 2015).

Of the 11 published studies, some of the most relevant research includes Elliot and colleagues (2004) study looking at the ATHENA (Athletes Targeting Healthy Exercise and Nutrition Alternatives) prevention program for athletes in 18 public high schools. This eight-session program was incorporated into teams' usual practice activities with the objective of reducing female athletes' disordered eating habits and to discourage the use of body-shaping substances (Elliot et al., 2004). The peer-led, team-based approach to prevention significantly reduced behaviors associated with EDs among female athletes as well as other health-harming behaviors (Elliot et al., 2004). These promising findings remained significant one to three years post-graduation (Elliot et al., 2008).

Smith and Petrie (2008) examined a group of female collegiate athletes and compared a cognitive dissonance intervention to two alternatives: a psychoeducational approach and a wait-list control group. The authors reported that the cognitive dissonance intervention, aimed at addressing inconsistent cognitions (e.g., thin-idealization versus ideal body for performance in sport), was effective in increasing body satisfaction amongst its participants and reducing sadness/depression and internalization of the importance of being physically fit. However, the difference between groups was not

statistically significant for any of these findings, likely owing to the small sample size in their study (29 female athletes; Smith & Petrie, 2008).

Becker and colleagues (2012) further explored the effectiveness of a cognitive dissonance intervention in female college athletes by comparing a unique “athlete-modified” dissonance prevention approach to an “athlete-modified” healthy weight intervention. The healthy weight intervention, which had previously been found to reduce ED risk factors in adolescent females (Stice, Marti, Spoor, Presnell, & Shaw, 2008), focused on encouraging small lifestyle changes to help maintain a healthy weight (Becker et al., 2012). Both prevention approaches examined by Becker and colleagues (2012) reduced ED risk factors at six-week and one-year follow-ups. These results are quite promising; however, a larger replication study is warranted given the relatively homogenous sample (168 female athletes attending one university) and lack of control group.

The BodySense project was developed as a positive body image initiative aimed at initiating a positive body climate for female athletes and their athletic clubs (Buchholz, Mack, McVey, Feder, & Barrowmen, 2008). The workshops focused on issues such as eating attitudes and beliefs, health, self-esteem, and stress management in sport, and were designed for athletes, coaches and parents. An empirical investigation of the BodySense project noted a modest reduction in athletes’ perceptions of pressure from sport clubs to be thin at post-intervention (Buchholz et al., 2008); however, no replication or follow-up studies have been conducted to examine the generalizability of the findings or the maintenance of change.

Most recently, Martinsen and colleagues (2014) implemented a one-year

intervention for first year students at Norwegian Elite Sport High Schools. The selective, primary intervention was based on the social-cognitive framework (Bandura, 1986), with a primary focus on self-esteem and self-efficacy. Intrinsic versus extrinsic motivation, and mastery versus performance goals were also a focus. The intervention used lectures, teamwork, and practical and theoretical skills assignments to convey information. Topics included self-esteem, self-confidence, motivation, growth and development, restitution, sport nutrition, EDs in relation to health, and performance. The authors also engaged coaches in the initiative. Seminars were arranged to educate coaches about self-esteem, self-efficacy, mental training, sports nutrition, body composition, weight issues, and the identification and management of disordered eating and EDs amongst athletes.

Additionally, the authors used the Internet and social media to engage the students online. Results of the study ($N = 465$) indicated that no new cases of EDs had developed in the intervention group during the course of the study. This is in stark contrast to the 13% of female athletes in control schools that developed DSM-IV (APA, 1994) EDs over the same period of time. Martinsen and colleagues (2014) also demonstrated a significant reduction in current dieting as well as three or more weight loss attempts. These results are promising, as they suggest that EDs may be prevented in athletes using systematic, multi-dimensional approaches. Replication and further investigation of the intervention used in this study should therefore be encouraged across a variety of athlete training settings to determine its generalizability.

Although it is still premature to conduct a meta-analysis examining the effects of ED prevention programs in athletes given the limited number of empirical studies conducted to date, accumulating evidence suggests that selective ED prevention programs

directed at high-risk athletes appear promising in their ability to reduce risk factors associated with EDs. However, what is notably lacking in the literature are empirical studies examining the mechanisms of change in ED prevention programs, and prospective studies assessing the long-term impact of these prevention programs in high risk athletes (Bar, Cassin, & Dionne, 2015). To this author's knowledge, only one study examining the effectiveness of ED prevention in athletes has attempted to implement a prevention program for a period longer than one year. Before Piran's (1999) study of ED prevention in young ballet dancers, no successful implementation of a long-term prevention program with validated positive outcomes had been documented, and, no study since has attempted to replicate her findings. For these reasons, it is worth reconsidering Piran's decade-long prevention study to better direct future prevention programs in athlete populations.

D. Piran's Eating Disorder Prevention Study in Athletes at High Risk

Between 1987 and 1996, Piran implemented a multifaceted ED prevention program at a highly competitive professional ballet school for students aged 10 to 18 years. The program was initiated after the ballet school's participation in a widely cited study (Garner & Garfinkel, 1980) revealed that AN and excessive dieting concerns were overrepresented in their population (Piran, 1999). However, unlike other prevention programs that are most often described as taking place over a number of weeks, Piran's intervention at the ballet school lasted a decade. Unique as well to this selective prevention program was its conceptualization as a three-pronged approach. The program included tertiary prevention, through the rehabilitation of persons experiencing current EDs, secondary prevention, by addressing early symptoms of ED behavior, and primary

prevention aimed to reduce the incidence of new cases of EDs in the school (Piran, Levine, & Steiner-Adair, 1999). With the aim of making systematic changes within this high-risk environment, the program was modeled on the World Health Organization's Health-Promoting Schools initiative (WHO, 1993, as cited in Piran, 1999).

Over the course of the ten years in which the study took place, the majority of the intervention occurred in group settings. One-on-one sessions were available upon request, particularly for those requiring secondary or tertiary intervention (Piran, Levine, & Steiner-Adair, 1999). Groups of age and gender-matched students ($n = 6$ to 20 per group) met with Piran 2 to 10 times annually to discuss their experiences with body shape and weight at the ballet school. Similarly, administration and staff at the school also met with Piran to help inform and direct the prevention program (Piran, 1999). These sessions helped to identify systematic factors within the school's environment that contributed to body weight and shape preoccupation, and facilitated several systematic changes in the school (Piran, 1999). For example, rather than focusing on body shape, the school changed its emphasis to stamina and body conditioning. This change meant that dance teachers were no longer allowed to make evaluative comments about students' body shape (Piran, 1999).

Over the ten years, a survey was conducted three times to assess for changes in disordered eating patterns and disturbed attitudes about body shape (Piran, 1999). The first survey was conducted as a baseline in 1987, the first year of the program. The second and third surveys were conducted in 1991 and 1996, respectively (Piran, 1999). The survey consisted of the Eating Attitude Test (EAT; Garner & Garfinkel, 1979), subscales from the Diagnostic Survey for Eating Disorders (DSED; Johnson 1985), and

the Eating Disorder Inventory (EDI; Garner, Olmstead, & Polivy, 1983; See methods section for descriptions of these measures). It was hypothesized that disordered eating and body dissatisfaction would decrease as the program progressed (Piran, 1999).

Consistent with the hypotheses, participants reported significant decreases in disordered eating patterns, disturbed attitudes about eating and body shape, and an increase in healthy eating habits (Piran, 1999). Beyond significant improvements on the battery of test scores, significant reductions in the percent of students who binged, vomited, or used laxatives were also noted (Piran, 1999).² As well, a significant reduction in the percent of students who restricted intake through fasting or other forms of dieting was found (Piran, 1999). These findings support the notion that prevention programs in high-risk environments can reduce ED symptomatology, and specifically reflect the utility of systematic, long-term intervention.

What remains unknown about this intervention, however, are the long-term effects. While shorter prevention program studies often report six month or one-year follow-ups (e.g., Becker et al., 2012; Carter et al., 1997; Paxton 1993), it is unclear how the individuals who participated in Piran's ED prevention program fared once they graduated from the school and entered the harsh reality of the professional dance world. It is worth noting that results from Piran's study found a gradual increase in body mass index (BMI) amongst students over the ten years. For example, in 1987, students in grades 10-12 had an average BMI of 17.7 kg/m², in 1991 the average BMI of this age group was 17.8 kg/m², and in 1997 it had increased to 18.4 kg/m². While these increases were not statistically significant, it is unclear how these changes may have affected the

² Because there were so few males as compared to females in the school, results were solely based on findings within the school's female population (Piran, 1999).

dancers when they sought work in the highly competitive dance world, where thinness is highly valued. Although Piran (1999) called for social and professional activism to change the thin ideal of the ballet world, similar to other high-risk sports, the need to be thin in ballet may be seen as essential to the aesthetic of this art, making it unlikely that these changes would persist in the ballet community.

These unanswered questions about the long-term effects of Piran's prevention program therefore make it difficult to fully appreciate its results. While on the one hand, initial findings clearly support the positive impact of the program and would point to the utility of applying this approach to similar high-risk training programs for athletes, it is unclear whether the program enabled any form of resilience among the dancers once they completed their training and entered the professional realm. To address this question, the current study reassessed participants of the program 15 or more years later in order to examine the long-term impact of a reportedly successful ED prevention program in a high-risk athlete population.

E. The Current Study

The current study sought to understand whether Piran's prevention program led to long-term resilience against disordered eating patterns and disturbed attitudes about eating and body shape amongst those who participated in the program. Piran's (1999) study was the first of its kind to implement a successful systematic intervention program in a high-risk training facility for elite adolescent athletes, and although the findings appeared promising, the long term impact of this prevention program (or any other ED prevention programs) on resilience against EDs has not yet been demonstrated.

To conduct this study, students that graduated from the ballet school between the

decades before, during and after the intervention were administered the same battery of questionnaires assessing eating patterns and body dissatisfaction completed by participants in Piran's original study.

Although the program began in September 1987, the decades/cohorts compared in this study were 1980-1989 (considered pre-intervention), 1990-1999 (intervention), and 2000–2009 (post-intervention). The decision to divide the cohorts this way was made for three reasons. First, Piran's approach was not just directed at the dancers but at the overall climate of the ballet school. Changing an entire dance faculty's attitudes toward eating and weight issues would not have happened overnight. Those students who graduated in 1988 and 1989 would likely have had more experience of the school's previous approach to these issues and were therefore included in the cohort prior to the intervention. Second, the artistic director of the ballet school changed in 1989. To date, the ballet school has only had two directors in its 55-year history. Although this is an obvious confound to this investigation, it was felt that aligning the cohorts with the shift in directorship of the school would allow for the interpretation of results to consider that this too may have impacted any differences found. Third, although the formal intervention Piran reported ended in 1996, she continued meeting with groups of students at the school until June 2002 (M. Staines, personal communication, February 1, 2015). The division of the cohorts in this way therefore takes her presence at the school beyond 1996 into consideration.

Given the clear impact that the prevention program appeared to have had on the students that took part in it, it was therefore hypothesized that dancers that were part of the intervention cohort (1990-1999) would display significantly less disordered eating

patterns and disturbed attitudes about body image and shape than the cohorts that graduated from the school before and after them.

2. METHOD

Participants

Alumni of the ballet school's full-time professional ballet program were recruited for participation in this study. The school maintains an alumni database that was shared with the primary investigator. The director of the ballet school approved the study and the use of alumni emails. The link to the online questionnaire was emailed to 759 alumni, and 267 responses to the questionnaire were collected³ (see Table 1 for a full breakdown of participant flow). Additionally, the ballet school's alumni Facebook page posted a link to the questionnaire. A full breakdown of respondents' characteristics is provided in the results sections. Once participants completed the questionnaire they were given the option of providing an email address that would be entered into a draw to win one of three prizes: one \$100 and two \$50 gift certificates to a widely accessible bookstore. Email addresses for the draw were collected as a separate questionnaire so that identities could not be associated with study responses. Prior to the commencement of data collection, Ryerson University's Research Ethics Board approved this study.

Measures

As the current study was a follow-up of the work conducted by Piran (1999), the same measures and specific subscales used by Piran were employed. In addition, given the particular focus on body appreciation in Piran's prevention approach (Piran 1999), the Body Appreciation Scale (Avalos, Tylka, & Wood-Barcalow, 2005) and Objectified Body Consciousness Scale (OBCS; Mckinley & Hyde, 1996) were added to the battery of questionnaires. Participants were also asked to provide demographic information, self-

³ The recruitment email did not indicate that participants must have graduated between 1980 and 2009. As such, the 267 responders were alumni from 1963 to 2013.

reported height and weight (to calculate body mass index; BMI = kg/m²), and details about their dance careers (see Appendix A for sample questions from each questionnaire). The questionnaire was posted online using Qualtrics (an online survey software).

Diagnostic Survey for Eating Disorders (DSED; Johnson, 1985). The DSED is either conducted as a semi-structured interview or administered as a self-report measure. It inquires about 12 different domains, including demographics, weight history, body image, dieting, binge eating, purging, exercise, sexual functioning, menstruation, medical and psychiatric history, life adjustment, and family history. As in Piran's study (1999), the DSED was administered as a self-report measure and only the demographic, body image, dieting, binge eating, purging, and exercise questions were used.

Eating Attitude Test (EAT; Garner & Garfinkel, 1979). The EAT was the first questionnaire specifically developed to assess symptoms of EDs (Mintz & O'Halloran, 2000). The scale asks participants to rate attitudes on a 6-point likert scale, from *Never* to *Always*. EAT total scores over 20 are considered to be indicative of a possible ED (Lane, Lane, & Matheson, 2004). Garner and Garfinkel (1979) reported good internal consistency, with a Cronbach's alpha of .94. Specifically among athletes, internal consistency of .79 has been reported (Lane, 2003). The present study also demonstrated good internal consistency for this measure (Cronbach's alpha = .86). As in Piran's study (1999), the 26-item version of the questionnaire was used.

Eating Disorder Inventory (EDI; Garner, Olmstead, & Polivy, 1983). The EDI is a 64-item self-report questionnaire that assesses for psychological and behavioral traits associated with AN and BN. It consists of eight subscales measuring: drive for thinness, bulimia, body dissatisfaction, ineffectiveness, perfectionism, interpersonal distrust,

interoceptive awareness, and maturity fears (Garner et al., 1983). Garner and colleagues (1983) reported sufficient internal consistency for all subscales, with alpha coefficients among their female sample ranging from 0.65-0.91. Additionally, good test-retest reliability has also been demonstrated ($r = .96$; Wear & Pratz, 1987). As in Piran's study, and previous research (Davis, 1990; Davis, Durnin, Gurevich, LeMaire, & Dionne, 1993), only the drive for thinness, bulimia, and body dissatisfaction subscales were summed as a measure of weight and diet concerns (WDC) in the current study. Good internal consistency for all three of these subscales (Cronbach's alpha = .81, .87, .91, respectively) has been demonstrated (Eberenz & Gleaves, 1994). The present study also demonstrated good internal consistency for this measure (Cronbach's alpha = .94, .81, .94 respectively). Additionally, scores collected from the EDI were coded using a scale of 1-6 (as opposed to coding 0 for the three lowest scores and then 1-3 for the three highest scores) in order to avoid a skewed distribution.

Body Appreciation Scale (BAS; Avalos, et al., 2005). The BAS is a 13-item measure of positive body image and body appreciation. Items are rated on a five-point likert scale ranging from 1 (never) to 5 (always). The items are totaled and averaged, creating an overall body appreciation score. Higher scores reflect greater body appreciation. Internal consistency of the BAS was reported by its authors with an alpha coefficient of 0.94. The present study also demonstrated good internal consistency for this measure (Cronbach's alpha = .94). The BAS was found to correlate highly with lower body shame ($r = -.73, p < .001$), providing support for good convergent validity (Avalos et al., 2005).

Objectified Body Consciousness Scale (OBCS; Mckinley & Hyde, 1996). The

OBCS is a 24-item self-report questionnaire that measures objectified body consciousness, conceptualized as body surveillance, body shame, and appearance control beliefs. Items are rated on a 7-point likert scale ranging from strongly disagree to strongly agree. The authors of the scale demonstrated good internal consistency for each subscale (Surveillance Scale, .79 and .76; Body Shame Scale, .84 and .70; and Control Beliefs Scale, .68 and .76) in undergraduates and middle aged women, respectively (McKinley & Hyde, 1996). In the present study, internal consistency for subscales of this measure were .63, .87, and .70 respectively.

Procedure

Alumni of the ballet school's professional ballet program listed in the school's alumni database were emailed an introduction and online link to the battery of questionnaires three times over four months. Following the initial email, a link to the battery of questionnaires was also posted on the school's alumni Facebook page.

Data Preprocessing

Raw data from completed questionnaires were downloaded from Qualtrics into Statistical Package for the Social Sciences (SPSS; version 20). The questionnaire did not collect names or even initials to maintain the anonymity of participants, and, as a result, it was not possible to check if someone completed the questionnaire more than once. To address this concern, IP addresses were checked. When two questionnaires were filled out with the same IP address and the year of graduation, sex, and current occupation were identical, the more complete questionnaire of the two was used and the other was deleted. If both were equally complete, the more recently completed questionnaire was kept. Five response sets were deleted for this reason. As well, if a participant did not provide a year

of graduation from the ballet school, her/his data were not included in analyses since this information was central to the study's purpose and hypothesis. Twenty response sets were removed for this reason. Additionally, participants who did not reveal their sex were also excluded from all subsequent analyses since this study was designed to specifically look at female students, as Piran (1999) had done. A total of 18 participants left this question blank and were removed. In most instances, individuals who left sex and date of graduation blank did not complete the rest of the questionnaire, so their data would not have been used in any event (see Table 1 for a full breakdown of participant flow).

3. RESULTS

Upon completion of data preprocessing, a total of 116 female alumnae of the ballet school from 1980 to 2009 (aged 22-60⁴) completed at least some of the measures included in the online questionnaire and were therefore included in the study. Forty of the participants graduated between 1980 and 1989, 28 graduated between 1990 and 1999, and 48 graduated between 2000 and 2009. However, not every participant completed the questionnaire in its entirety, and, as a result, the number of participants who completed each measure varies. Of the 72 participants who completed the online questionnaire's ethnicity question⁵, 87.5% self-identified in an open ended question as White (or Caucasian), 4% identified as Asian, 2.8% identified as Latin-American, and 1.4% identified as South-East Asian, Aboriginal-White, Jewish, or Haitian-White. In comparison, Piran (1999) reported that 96% of her sample was White (see Table 1 for a summary of demographic characteristics by decade).

Analysis of Outcome Measures

Given the similar purpose of the EAT and EDI (i.e. to assess for symptoms/traits associated with EDs) a multivariate analysis of variance (MANOVA) was conducted to compare EAT and EDI (WDC) total scores of alumnae. Box's test revealed that the assumption of equal covariance matrices was met, $F(6, 59950.22) = 0.79, p = .58$.

⁴ If the oldest participants graduated from high school in 1980 (at approximately 17-19 years of age), they should have been no more than 53-54 in 2014. It is therefore unclear why one participant reported that she was 60 years old. Possible explanations include: the reported age was a typo, the participant attended the program at an older age; the participant was a graduate of the ballet school's teacher training program and participated in the questionnaire by mistake. In any event, the participant was included in subsequent analyses. Not including her did not change any of the findings.

⁵ The ethnicity question was not added to the questionnaire until after the questionnaire had already been online for six days. As a result, complete data are not available for this variable.

Levene's Test of Equality of Error Variances demonstrated the assumption of homogeneity of variance was also met, EAT $F(2, 89) = 2.30, p = .11$, EDI $F(2, 89) = 0.65, p = .52$. Using Pilla's Trace, a multivariate test statistic considered robust when sample sizes are unequal (Field, 2009), no significant differences were found on either of these measures between any decade, $V = .06, F(4, 178) = 1.35, p = .25$ (see Table 2 for descriptive statistics and univariate analyses).

To explore whether there were specific factors related to body image and eating pathology that varied by decade, a MANOVA was also conducted to explore the effects of cohort on individual subscales of the EAT and EDI (see Table 3 for descriptive statistics). Box's test revealed that the assumption of equal covariance matrices was met, $F(42, 14410.40) = 1.20, p = .17$. Levene's Test of Equality of Error Variances demonstrated the assumption of homogeneity of variance was also met for all subscales, EAT Diet subscale $F(2, 89) = 1.85, p = .16$, Bulimia and Food Preoccupation subscale $F(2, 89) = 0.81, p = .45$, Oral Control subscale $F(2, 89) = 2.31, p = .12$, EDI Drive for Thinness subscale $F(2, 89) = 1.46, p = .24$, Bulimia subscale $F(2, 89) = 2.81, p = .07$, Body Dissatisfaction subscale $F(2, 89) = 0.19, p = .83$. Using Pilla's trace, there was a significant effect of graduation decade on EAT and EDI subscale scores, $V = 0.24, F(12, 170) = 1.96, p = 0.03$. Further univariate analyses of the outcome variables revealed a significant effect of cohort only on the EDI Bulimia subscale, $F(2, 89) = 5.58, p = .01$, partial $\eta^2 = .11$ (see Table 3). A Bonferroni post-hoc analysis demonstrated that mean scores of the EDI bulimia subscale from graduates of the 1980s were significantly higher than graduates of the 2000s ($p = 0.01$).

A MANOVA was conducted to explore subscales of the OBCS (see table 4 for descriptive statistics). Box's test revealed that the assumption of equal covariance matrices was met, $F(12, 20258.05) = 0.71, p = .75$. Levene's Test of Equality of Error Variance demonstrated the assumption of homogeneity of variance was also met for all subscales, Surveillance subscale $F(2, 75) = 1.21, p = .31$, Body Shame subscale $F(2, 75) = 1.11, p = .33$, Control subscale $F(2, 75) = 0.21, p = .81$. No significant differences were found for any of the subscales between any graduation decade, $V = .05, F(6, 148) = 0.65, p = .69$ (see Table 4 for univariate analyses).

An ANOVA was conducted to examine any differences on BAS average scores between alumni from the 1980s ($n = 32, M = 3.84, SD = 0.66$), 1990s ($n = 22, M = 3.99, SD = 0.87$), and 2000s ($n = 42, M = 3.63, SD = 0.79$). Levene's Test of Equality of Error Variance demonstrated the assumption of homogeneity of variance was met, $F(2, 93) = 2.84, p = .63$. No significant differences in BAS scores were found among the three decades of alumni, $F(2) = 1.71, p = .19$.

To examine data from the DSED, chi-square analyses were conducted on individual questions. No significant association was found between binge eating behaviour and decade of graduation from the ballet school. Chi-square analysis also found that, although rates of vomiting to lose weight have been continuously dropping (41.7% in 1980s, 24% in 1990s, 19.6% in 2000s; see Figure 2), no significant associations were found between vomiting to lose weight and decade of graduation, $\chi^2(2, N = 107) = 5.15, p = .078$.

A chi-square analysis revealed a significant association between laxative use to control weight and decade of graduation, $\chi^2(2, N = 106) = 7.31, p = .02$, and it appears

the rates have also been continuously dropping (44.4% in 1980s, 24% in 1990s, and 17.8% in 2000s; see Figure 2).

4. DISCUSSION

The purpose of this study was to investigate if a reportedly effective ED prevention initiative for professional ballet dancers in training had any long term effects 15 or more years post intervention. Results of this study demonstrated that students graduating from the ballet school from 1990 onward (i.e., those who participated in the ED prevention intervention or attended the ballet school following this intervention) reported lower scores on the bulimia subscale of the EDI and lower rates of certain extreme weight loss behaviours. Specifically, these reductions met statistical significance in alumnae from the post-intervention group. The bulimia subscale of the EDI indicates a tendency toward thoughts and behaviors that could lead to bulimia by asking questions about behaviours associated with bingeing and purging (e.g., “I have gone on eating binges where I have felt that I could not stop” and “I have the thought of trying to vomit in order to lose weight”; Garner et al., 1983). This finding is consistent with the significantly lower rates of laxative use to control weight and a trend toward lower rates of vomiting to control weight relative to the group that attended the ballet school prior to the ED prevention initiative that were found. Although the 20.4% difference in self-induced vomiting was only approaching significance, this finding may be the result of lack of power due to small sample size, and could potentially reflect a meaningful change in this behavior. A power analysis was conducted post-hoc to determine if the non-significant associations between decade of graduation and vomiting to control weight may have been the result of a lack of power. Power estimates for the chi-square analysis were calculated with G-Power (version 3.1) based on the small effect size found for the chi-square analysis of vomiting behavior ($V = 0.22$) and its two degrees of freedom. The

analysis revealed that 320 participants would have been needed to achieve enough power to detect statistically significant associations between vomiting and decade of graduation, thus supporting the possibility that this non-significant finding may have been due to the sample size.

These results also demonstrate that rates of certain extreme weight loss behaviours amongst the ballet school graduates have become more similar to a non-elite athlete population than they were before the introduction of the intervention. For example, Regan and Cachelin (2006) found that in a sample of 196 White American college aged women and men, 9.8% of women reported self-induced vomiting and 23.3% reported using laxatives, diet pills, or diuretics. This is comparable to the ballet school graduates from 1990 onward, of whom 24% or fewer endorsed laxative use and vomiting.

With no direct control group in the current study, it is important to consider if the differences found between cohorts in the current study is a reflection of trends in the general population. While rates of bulimia symptoms such as the use of laxatives and vomiting to control weight vary greatly from study to study, epidemiological studies that have examined the prevalence rates of these behaviours over time suggest that rates of these behaviours in the general population have remained relatively stable over time, suggesting that the changes in prevalence rates amongst the ballet school's graduates are not a reflection of changes seen in the general population. Although no study was found that compared rates of these behaviors over the full three decades considered in the current study, one study looking at a German sample (aged 18-94) found no significant changes in the prevalence of laxative use and vomiting to control weight when comparing a sample of 911 women in 1990 with a sample of 1202 women in 1997 (Westenhofer,

2000). Similarly, Crowther, Armey, Luce, Dalton, and Leahy (2008) found relatively stable levels of these behaviours from 1992-2002 in female American, undergraduate students. As well, in a study tracking American undergraduate students' lifetime prevalence of disordered eating behaviours, although significant reductions were found for lifetime prevalence rates of binge eating and fasting from 1982 to 2002, no significant reductions in purging behaviours, including vomiting and laxative use, were found (Keel, Heatherton, Dorer, Joiner, & Zalta, 2006). Thus, although the current study did not include an age-matched comparison group of non-athletes, these findings suggest that specific changes found in the prevalence rates of laxative use and self-induced vomiting amongst the ballet school graduates was not simply a reflection of general trends in laxative use and vomiting to control weight.

Interpretation of Findings and Future Directions

This study aimed to investigate the long-term impact of an effective ED prevention initiative for professional ballet dancers in training. This is the first time that the effects of an ED intervention have been considered 15 or more years after the intervention took place. The results suggest that the intervention may have had lasting effects on the dancers' wellbeing, specifically by lowering rates of thoughts and behaviours associated with bulimia and by reducing the lifetime use of dangerous measures to control weight. However, given that these effects on the dancers' wellbeing continued to drop and met statistical significance beyond the end of the intervention, it seems likely that if the changes can be credited to the intervention, the most potent elements of the intervention were likely the systematic changes to the school that Piran directed. By shifting the focus from body weight and shape to factors such as stamina and

body conditioning, Piran appears to have helped the school's faculty reframe more specific and adaptive goals for the dancers even after Piran's program was discontinued. This may mean that the key to developing an ED prevention initiative for athletes at risk may not just be addressing the athletes, but, perhaps more importantly, the faculty who are training them. By shifting an institution's values and focusing on educating and changing the approaches of coaches rather than on the individual athletes, this approach may also maximize the number of individuals a training institution's ED prevention intervention could potentially reach.

The most recent ED intervention study published by Martinsen and colleagues (2014) included seminars for coaches and "aimed to present factual information and educate coaches about self-esteem, self-efficacy, mental training, sports nutrition, body composition, weight issues, and how to identify and manage disordered eating and ED problems among athletes" (p. 437-438). Long-term follow-up of this intervention and of others that have also included coaches in the intervention (e.g., Buchholz, et al., 2008) may therefore help to better understand the role that coaches may play in the prevention of EDs in athletes.

A qualitative follow-up of the current study in the form of short, semi-structured interviews may, in addition, help to clarify alumnae's experiences of ED symptomatology and clarify the influence that training at the ballet school may or may not have played in that experience. In fact, without any solicitation, several participants of the study chose to email the primary investigator upon completion of the questionnaire to share how they felt the school influenced their experience of body weight and shape throughout their dance careers and beyond. Although these informal reports are beyond the scope of the

current investigation, they suggest that alumnae are insightful about the reasons they may or may not have developed symptoms of EDs, and may provide useful information for the ballet school and similar elite athlete training institutions to help prevent future cases of EDs.

Collecting similar data from other comparable professional ballet school alumni and from a non-athlete sample who graduated from high school in the 1980s, 1990s, and 2000s would also help to further clarify whether the differences between groups observed in the current study are likely attributed to the ED prevention program. If after these investigations the differences in ED symptomatology across time appear unique, the implementation of the intervention and investigation of its effects in different types of elite athlete training institutions would be warranted.

Limitations

Several limitations should be considered when interpreting the results of this study. First, neither the study conducted by Piran (1999) nor the current follow up study included a control group. This makes it difficult to know whether the significant changes were associated with the intervention, or were simply reflective of the reduction in the use of these methods in the general population. Previous research indicates that trends in the use of these methods were not dropping in the general population in the 1990s (Crowther et al., 2008; Keele et al., 2006; Westenhofer, 2000), which suggests that something within the school's environment may have been responsible for the improvements.

Even if the school's environment was responsible for the long lasting differences between those who attended the school before, during, and after the intervention, there

are other variables to consider. Mainly, the directorship at the ballet school changed in 1989. The new director was supportive of the intervention, as acknowledged by Piran (1999), and has been credited with “radically alter(ing) the culture at ... (the school, by), providing nutrition education to students and instituting a zero-tolerance policy for unhealthy eating behaviours” (Dean, 2014). For example, the school now has a strict protocol for managing EDs, as outlined in the school’s Student and Parent Handbook (NBS, 2013). Although Piran’s ED prevention program undoubtedly played an important role in facilitating progress in this area, especially considering that reductions in extreme weight control methods appear to have carried on beyond Piran’s intervention, the strong vision of the director to change the status of ED symptomatology amongst the school’s dancers appears to likely have been an essential ingredient to the positive long-term effects found.

Another limitation of this study is potential self-selection bias. It is possible that graduates of the school who experienced the most severe EDs chose not to stay in touch with the school and, consequently, were not a part of the school’s alumni email database. As well, not everyone who received the recruitment email chose to participate in the study, quite possibly for a similar reason. The findings of this study may therefore not accurately reflect differences among the three cohorts. That being said, given that a total of 25.9% of participants reported vomiting, using laxatives, or both to control weight, alumnae with a lifetime prevalence of eating disorder symptomatology did complete the questionnaire, suggesting the sample does represent alumnae with a range of experiences with body weight and shape.

In addition, it is possible that the effects found both in Piran's (1999) study and in the current study reflect a change in the students selected to attend the ballet school over the years. However, Piran reported that the director of the school did not observe any new trends in the selection process (Staines, 1997, as cited in Piran, 1999), making it unlikely that this should account for the differences found between cohorts.

5. CONCLUSION

The current study was the first of its kind to investigate the long-term effects of an ED prevention program for a group of professional ballet dancers in training considered high risk. Results revealed that 15 or more years after participating in the program, some of the effects of the intervention were still apparent. Mainly, alumnae who attended the school during or after the intervention had fewer thoughts and behaviours associated with bulimia, lower lifetime prevalence of laxative use, and a trend toward lower rates of vomiting to control weight. These findings suggest that the intervention developed by Piran (1999) may have helped to create an environment at the school that lowered the risk of dancers developing EDs. However, before implementing a similar intervention in other elite athlete training facilities, data from alumnae of other professional ballet schools and non-athlete controls should be compared to better determine the role the intervention played in the demonstrated findings.

Figure 1. Flow of Participants in the Study

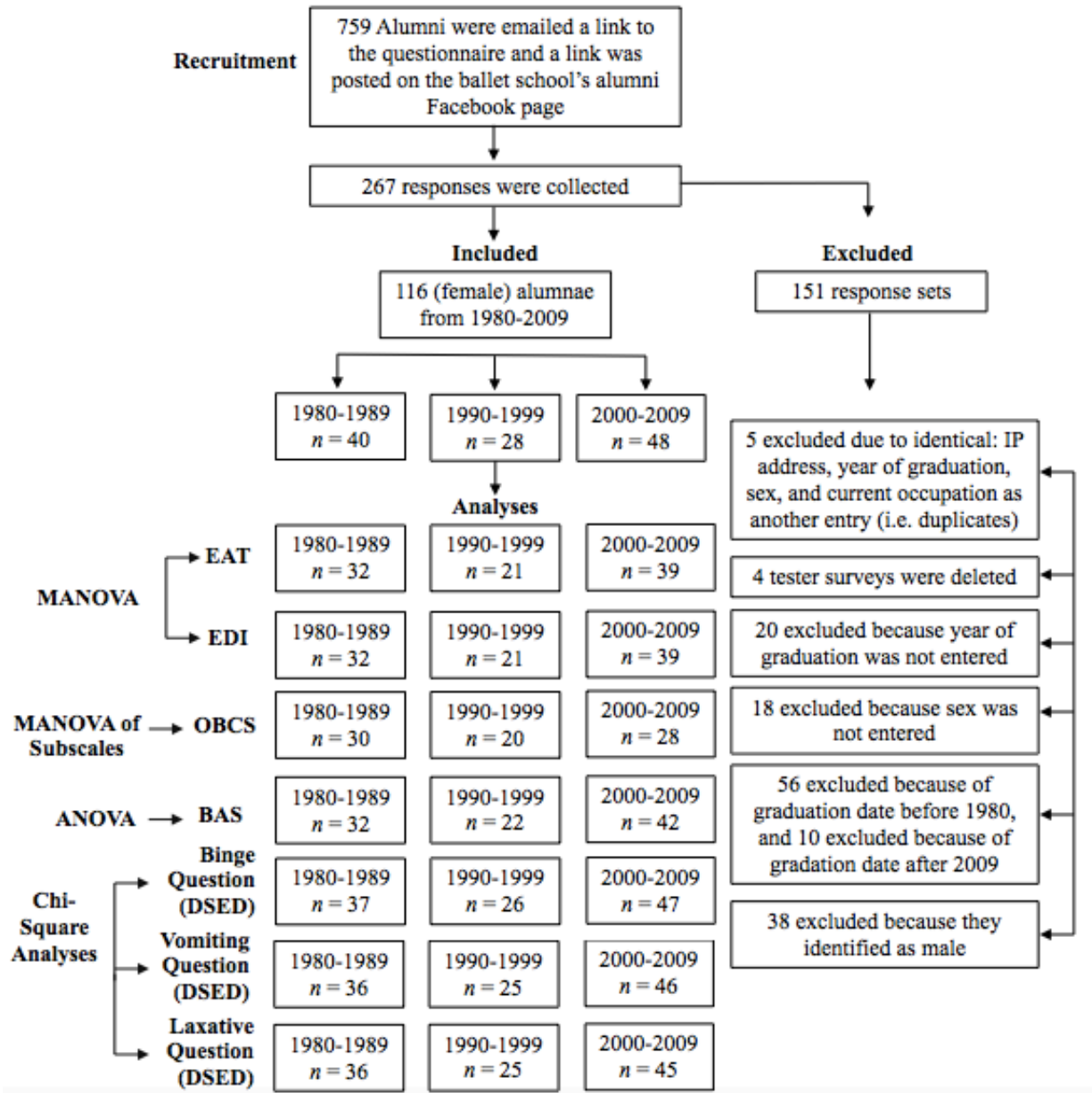


Figure 1. ANOVA = Analysis of Variance, BAS = Body Appreciation Scale, DSED = Diagnostic Survey of Eating Disorders, EAT = Eating Attitude Test, EDI = Eating Disorder Inventory, MANOVA = Multivariate Analysis of Variance, OBCS = Objectified Body Consciousness Scale.

Table 1. Demographic Information by Decade

Variable	1980s	1990s	2000s
Age; Mean (SD)	47 (4.33) (<i>n</i> = 28)	39.08 (5.77) (<i>n</i> = 13)	27.94 (5.07) (<i>n</i> = 32)
Ethnicity (%)			
White	25(89.90%)	11(84.62%)	27(87.10%)
Asian	1(3.57%)	0	2(6.45%)
Latin-American	0	1(7.69%)	1(3.23%)
South-East Asian	1(3.57%)	0	0
Aboriginal-White	0	0	1(3.23%)
Jewish	0	1(7.69%)	0
Haitian-White	1(3.57%) (<i>n</i> = 28)	0 (<i>n</i> = 13)	0 (<i>n</i> = 31)
Highest level of education (%)			
High school	9(33.3%)	5(38.46%)	14(43.75%)
Undergraduate Degree	8(29.63%)	3(23.08%)	13(40.63%)
Master's Degree	2(7.40%)	2(15.38%)	1(3.13%)
Doctorate	0	0	1(3.13%)
Other	8(29.63%) (<i>n</i> = 27)	3(23.08%) (<i>n</i> = 13)	3(9.38%) (<i>n</i> = 32)
BMI; Mean (SD)	21.52 (2.71) (<i>n</i> = 35)	20.70 (2.64) (<i>n</i> = 26)	19.65 (1.74)* (<i>n</i> = 44)
Behaviour occurred one or more times during the past month (%):			
Bingeing	3(8.57%)	4(16.00%)	15(32.61%)
Vomiting	2(5.71%)	0	1(2.17%)
Laxative use	0	1(4.00%)	2(4.35%)
Fasting	4(11.43%)	6(24.00%)	4(8.70%)
Use of diet pills	0	1(4.00%)	1(2.17%)
Use of water pills	1(2.86%)	0	0
Use of enemas	0	1(4.00%)	0
Exercise to control weight	19(54.29%) (<i>n</i> = 35)	15(60%) (<i>n</i> = 25)	33(71.74%) (<i>n</i> = 46)

Note. *Two outliers were excluded from this mean calculation because of the high likeliness that the participants mis-entered their height and weight, resulting in BMIs of 6.66 and 41.97.

Table 2. Eating Attitudes Test (EAT) and Eating Disorder Inventory – Weight and Diet Concerns (EDI-WDC) Total Scores of Alumnae Based on Decade of Graduation and Univariate Analyses Comparing Scores Across Decades

Measure	1980s (<i>n</i> = 32) Mean (SD)	1990s (<i>n</i> = 21) Mean (SD)	2000s (<i>n</i> = 39) Mean (SD)	<i>F</i> -value	(<i>df</i>)	<i>P</i> -value
EAT	7.59 (6.73)	9.29 (9.83)	8.35 (8.79)	0.26	(2, 89)	.77
EDI	104.09 (22.45)	101.95 (24.96)	96.26 (23.02)	1.07	(2, 89)	.35

Table 3. Eating Attitudes Test (EAT) and Eating Disorder Inventory (EDI) Subscale Scores of Alumnae Based on Decade of Graduation and Univariate Analyses Comparing Scores Across Decades

Measure Subscales	1980s (<i>n</i> = 32) Mean (SD)	1990s (<i>n</i> = 21) Mean (SD)	2000s (<i>n</i> = 39) Mean (SD)	<i>F</i> -value	(<i>df</i>)	<i>P</i> -value
EAT:						
Diet Subscale	6.02 (5.44)	6.76 (7.06)	6.62 (7.24)	0.09	(2, 89)	.91
Bulimia/ Food Preoccupation Subscale	0.66 (1.77)	0.90 (1.92)	0.74 (1.31)	0.15	(2, 89)	.86
Oral Control Subscale	0.88 (1.16)	1.62 (1.66)	1.00 (1.26)	2.18	(2, 89)	.12
EDI:						
Drive for Thinness Subscale	30.72 (8.58)	29.00 (10.74)	28.59 (9.34)	0.48	(2, 89)	.62
Bulimia Subscale	38.59 (3.44)	37.76 (4.38)	35.44 (4.45)	5.58	(2, 89)	.01*
Body Dissatisfaction Subscale	34.78 (12.80)	35.19 (12.08)	32.23 (11.55)	0.54	(2, 89)	.58

Note. * $p < .05$

Table 4. OBCS Subscale Scores of Alumnae Based on Decade of Graduation and Univariate Analyses Comparing Scores Across Decades

Measure Subscale	1980s (<i>n</i> = 30) Mean (SD)	1990s (<i>n</i> = 20) Mean (SD)	2000s (<i>n</i> = 28) Mean (SD)	<i>F</i> -value	(<i>df</i>)	<i>P</i> -value
Surveillance Subscale	4.18 (0.95)	4.37 (1.17)	4.40 (1.19)	0.34	(2, 75)	.48
Body Shame Subscale	2.91 (1.26)	3.36 (1.53)	3.28 (1.30)	0.83	(2, 75)	.71
Control Subscale	4.73 (0.92)	4.49 (0.81)	4.88 (0.89)	1.12	(2, 75)	.23

Figure 2. Lifetime Prevalence of Vomiting and Laxative Use to Control Weight in Participants

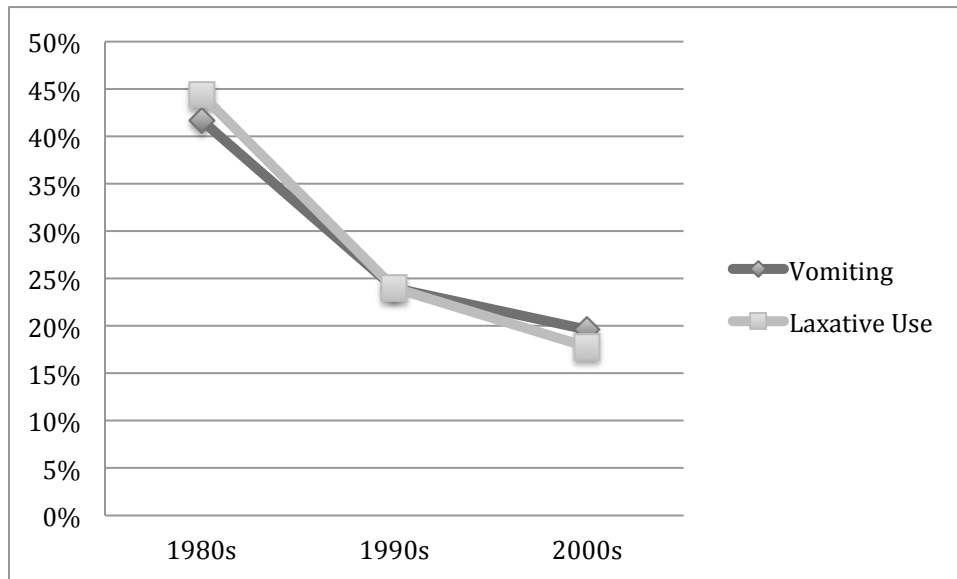


Figure 2. The association between decade of graduation and lifetime prevalence of vomiting to control weight ($N = 107$) was nearing significance ($p = .078$). The association between decade of graduation and lifetime prevalence of laxative use to control weight ($N = 106$) was significant ($p = .02$).

Appendix A. Sample Questions from Each Questionnaire

Sample Questions from the Eating Attitudes Test (EAT-26; Garner & Garfinkel, 1979)

For each item, please indicate the description that best characterizes your feelings or behaviours (Always, Very Often, Often, Sometimes, Rarely, Never)

Diet Subscale

1. Am terrified about being overweight.
2. Aware of caloric content of the food that I eat.
3. Particularly avoid food with carbohydrate content.

Bulimia and Food Preoccupation Subscale

1. Find myself preoccupied with food.
2. Have gone on eating binges where I feel that I may not be able to stop.
3. Vomit after I have eaten.

Oral Control Subscale

1. Avoid eating when I am hungry.
2. Cut food into small pieces.
3. Feel that others would prefer if I ate more.

Sample Questions from the Eating Disorder Inventory (EDI; Garner, Olmstead, & Polivy, 1983)

For each item, please indicate the description that best characterizes your feelings or behaviours (Always, Very Often, Often, Sometimes, Rarely, Never).

Drive for Thinness Subscale

1. I eat sweets and carbohydrates without feeling nervous.
2. I feel extremely guilty after overeating.
3. I am terrified of gaining weight.

Bulimia Subscale

1. I eat when I am upset.
2. I stuff myself with food.
3. I have the thought of trying to vomit in order to lose weight.

Body Dissatisfaction Subscale

1. I think that my stomach is too big.
2. I think that my thighs are too large.
3. I feel satisfied with the shape of my body.

Sample Questions from the Diagnostic Survey for Eating Disorders (DSED; Johnson, 1985)

1. Have you ever used laxatives to control your weight or “get rid of food”? Yes/No
2. How old were you when you first took laxatives for weight control? _____
3. How long have you been using laxatives for weight control? _____

Sample Questions from the Body Appreciation Scale (BAS; Avalos, et al., 2005)

For each item, please indicate the description that best characterizes your feelings or behaviours (Never, Seldom, Sometimes, Often, Always)

1. I respect my body.
2. On the whole, I am satisfied with my body.
3. My self-worth is independent of my body shape or weight.

Sample Questions from the Objectified Body Consciousness Scale (OBCS; Mckinley & Hyde, 1996)

For each item, please indicate the description that best characterizes your feelings or behaviours (Strongly, Disagree, Disagree, Somewhat Disagree, Neither Disagree nor Agree, Somewhat, Agree, Agree, Strongly Agree.

Surveillance Subscale

1. I rarely think about how I look.
2. I think it is more important that my clothes are comfortable than whether they look good on me.
3. I think more about how my body feels than how my body looks.

Body Shame Subscale

1. I never worry that something is wrong with me when I am not exercising as much as I should.
2. When I'm not exercising enough, I question whether I am a good enough person.
3. Even when I can't control my weight, I think I am an okay person.

Control Subscale

1. A large part of being in shape is having that kind of body in the first place.
2. I think a person can look pretty much how they want to if they work at it.
3. I think a person's weight is mostly determined by the genes they are born with.

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