

School-Based Prevention Programs for Eating Disorders

Achievements and Opportunities

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Abstract

Scarce resources are dedicated to research on school-based prevention programs for eating disorders. Despite this, however, recent years have witnessed an abundance of publications on controlled prevention trials. We now have a cumulative body of knowledge available to guide future developments in the prevention of eating disorders.

Medline and PsychInfo were searched for the years 1985–2002 to find relevant publications for this review. Nineteen universal and ten targeted school-based prevention programs were identified and then evaluated.

The results obtained by the controlled trials evaluated reassure parents, teachers, and stakeholders in the healthcare sector that school-based eating disorder prevention programs do not have harmful effects on student attitudes and behaviors. Targeted prevention programs have obtained promising results in high-risk individuals. Other positive effects have been obtained using an interactive format. Universal prevention programs have unfortunately been disappointing in their ability to change unhealthy behaviors.

Results can be improved by gaining a greater understanding of those risk factors which are most strongly linked to eating disorders and most susceptible to change. A broad range of interventions is needed for further consideration. Promising results from the field of eating disorder prevention and from modern risk factor research could build a new generation of universal prevention trials for eating disorders without the methodolog-

ical limitations seen in the current literature and with real effectiveness in achieving the goal of reducing the prevalence of eating disorders in the general population.

Eating disorders are one of the most common health problems among young females in Western countries.^[1] These disorders are associated with significant impairment in health and interpersonal relations, have a high relapse rate,^[2] and carry increased risk of death.^[3,4] In fact, only a small proportion of patients with eating disorders receive clinical treatment.^[5] Many patients begin treatment only after many years of illness when the disorder has already become chronic.^[6] Complete remission from symptoms is reached in only 30-40% of patients who begin gold standard treatments.^[7,8] Many patients need intensive and costly inpatient treatment.^[9]

The above facts have stimulated an ever growing interest in developing programs to prevent eating disorders in the past 10 years. Priority has been given to the development of school-based programs because eating disorders usually start during school-age years^[10] and schools often provide access to adolescents at risk. School-based eating disorder prevention programs have been developed in Canada,^[11,12] the US,^[13-16] Norway,^[17] Switzerland,^[18] The Netherlands,^[19] the United Kingdom,^[20,21] Italy,^[22-24] Australia^[25,26] and Israel.^[27] This field of study has seen a considerable growth despite scarce knowledge of the mechanisms involved in the development of eating disorders and the minimal resources dedicated to research on eating disorder prevention programs. Many prevention trials have been published in recent years and a cumulative body of knowledge is now available to help guide future developments in the prevention of eating disorders.

The aim of this article is to provide a comprehensive update of research on school-based eating disorder prevention programs. This update illustrates an overall background of the field, the

contents and design features of the programs that are associated with positive intervention effects, the implications for stakeholders in the healthcare sector and the work that still remains to be done.

1. Classification and Diagnosis of Eating Disorders

An eating disorder can be defined as “a persistent disturbance of eating behavior or behavior intended to control weight, which significantly impairs physical health or psychological functioning. This disturbance should not be secondary to any recognized general medical disorder (e.g. a hypothalamic tumor) or any other psychiatric disorder (e.g. an anxiety disorder)”.^[28]

Table I shows a classification of eating disorders and their main diagnostic criteria. Note that there is a third eating disorder category in addition to anorexia nervosa and bulimia nervosa: atypical eating disorders,^[28] the equivalent American term being eating disorders not otherwise specified (EDNOS).^[29] The best known example of EDNOS is binge eating disorder. This term is used to define an eating disorder characterized by recurrent episodes of binge eating without the regular use of inappropriate compensatory behaviors characteristic of bulimia nervosa.^[29]

2. Distribution of Eating Disorders

Table II summarizes our knowledge of the distribution of eating disorders. The general impression is that eating disorders have become more frequent over recent decades.^[30] While the frequency of bulimia nervosa does appear to have increased,^[31-33] the apparent increase in anorexia nervosa^[34,35] may not necessarily be

Table I. Classification and diagnosis of eating disorders^[29,30]

Classification of eating disorders	Principal diagnostic criteria
Anorexia nervosa	Active maintenance of an unduly low bodyweight (e.g. body mass index ≤ 17.5 kg/m ²). Intense fear of gaining weight or becoming fat, even though underweight. Disturbance in the way in which one's bodyweight and shape is experienced, undue influence of bodyweight or shape on self-evaluation, or denial of the seriousness of the current low bodyweight. Amenorrhea in postmenarchial females who are not taking an oral contraceptive
Bulimia nervosa	Recurrent binge eating (e.g. recurrent episodes of uncontrolled overeating). Recurrent inappropriate compensatory behavior in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, enemas, or medications; fasting; or excessive exercise. The binge eating and the compensatory behaviors both occur, on average, at least twice a week for 3 months. Overvaluation of shape and weight (e.g. judging self-worth largely, or exclusively, in terms of shape and weight). Diagnostic criteria for anorexia nervosa are not met
Atypical eating disorders (or eating disorder not otherwise specified)	Conditions that meet the definition of an eating disorder but not the criteria for anorexia nervosa or bulimia nervosa

Table II. Distribution of eating disorders^[30,32,36,38-42]

	Anorexia nervosa	Bulimia nervosa
Worldwide distribution	Mainly Western societies	Mainly Western societies
Racial origin	Mainly White people	Mainly White people
Social class	Possibly higher incidence in higher social classes	Even distribution
Mean age of onset (years)	15–18 (some young adults)	18–21 (some adolescents)
Prevalence (%)	0.28 (in young females)	1.0 (in young females)
Incidence (per 100 000 per year)	19 in females, 2 in males	29 in females, 1 in males
Secular trend	Possible increase	Likely increase

due to a rise in the actual frequency of cases, but rather, may be explained by alternative reasons including changes in diagnostic criteria, improved methods of case detection or the wider availability of services.^[36] The fact that many patients with eating disorders persist in not seeking professional help complicates epidemiological research.^[37]

Little is known of the distribution of EDNOS in the community but the proportion of patients with EDNOS varies from 20–60% of patients seeking treatment for eating disorders.^[28] Atypical eating disorders, judging from clinical experience, seem to affect adolescents and young adult women.^[30]

Finally, the prevalence of ‘eating problems’ that do not reach diagnostic thresholds in the community seems very high, although precise data are not available due to the absence of a clear definition of the term ‘eating problems’. A cross-sectional school-based survey of dieting and eating problems in 6728 adolescents in the US aged 5–12 years found that 13% of girls and 7% of boys reported eating problems.^[43] A similar rate of eating problems has also been observed in Mediterranean countries.^[44]

3. Risk Factors for Eating Disorders

In general, but not necessarily always, preventative strategies for a disorder require a knowledge of the processes that are involved in the development of that disorder.^[45] The study of risk factors for eating disorders is, therefore, a fundamental area for developing effective prevention programs.

Research into the pathogenesis of eating disorders has focused almost exclusively on anorexia nervosa and bulimia nervosa. Data from such research indicate that eating disorders seem to derive from genetic predisposition and from a range of environmental risk factors. Genetic predisposition is suggested by the observation that eating disorders and certain associated traits run in families,^[46]

and are more prevalent in monozygotic twins than dizygotic twins.^[30,46] Genetic predisposition of eating disorders is also supported by some preliminary molecular genetic studies.^[46-50] However, all findings on genetic predispositions must be judged as preliminary.^[30]

The role of environmental risk factors derives from some prospective studies (see Stice^[51] for a thorough review), and a series of community-based, case-control studies.^[52-54] The various risk factors differ in nature and specificity. Some are adverse pre-morbid experiences that are also observed in other psychiatric disorders (e.g. childhood sexual abuse, adverse parenting). Others, especially those for bulimia nervosa, are typical of eating disorders (e.g. childhood and parental obesity, parental alcoholism, and other social factors that operate by sensitizing the person to her or his shape, and encouraging dieting and thinness). Other risk factors include personality traits (e.g. low self-esteem and perfectionism, the latter of which seems a particularly common antecedent to anorexia nervosa).^[52,53]

These findings suggest that eating disorder prevention programs must focus on both general and specific risk factors. Unfortunately, several strongly-linked general risk factors (e.g. having parents with mental disorders, being abused during childhood, and experiencing adverse parenting) cannot be addressed by a school-based prevention program.

Table III shows the main risk factors for anorexia nervosa and bulimia nervosa.

4. School-Based Prevention Programs for Eating Disorders

4.1 A Few Definitions

Eating disorder prevention measures can be classified into two broad categories:^[58] universal programs and targeted programs. Universal programs are directed at all consenting individuals in a given population, such as a given grade level in a school. Targeted programs focus only on subpopulations at high risk for developing an eating disorder, such as individuals who possess a risk factor that has been shown to predict the onset of eating disorders. In practice this distinction is difficult to maintain. Many universal programs for the prevention of eating disorders, for example, are focused only on girls and women – and being female is considered the risk factor most strongly linked to eating disorders.^[58]

A further classification of eating disorder prevention efforts involves the level of intervention. In theory, prevention programs may be applied at the individual level (e.g. protecting a particular child from exposure to some specific risk factors or teaching particular coping skills to minimize the effects of risk factors) or at

Table III. Main risk factors^a for anorexia nervosa and bulimia nervosa^[30,47,51-54,56,57]

General factors

Female

Adolescence and early adulthood

Living in a Western society

Individual-specific factors

Family history

eating disorders

depression

alcoholism (bulimia nervosa)

obesity (bulimia nervosa)

Premorbid experiences

adverse parenting (especially low contact, high expectations, parental discord)

sexual abuse

family dieting

critical comments about eating, shape, or weight from family and others

occupational and recreational pressure to be slim

media exposure to images of thin people

Premorbid characteristics

low self-esteem

perfectionism (risk factor for anorexia nervosa and to a lesser extent bulimia nervosa)

thin-ideal internalization

anxiety and anxiety disorders

obesity (risk factor for bulimia nervosa)

a Risk factors refer to an "antecedent condition associated with an increase in the likelihood or adverse, deleterious, or undesirable outcomes".^[55]

the community level (e.g. eliminating some risk factors from the community or training all the community to be resistant to risk factors). This distinction, although it has heuristic validity, is difficult to maintain in practice.^[59]

4.2 Theories and Techniques of Eating Disorder Prevention Programs

Two theories have dominated research on school-based prevention programs of eating disorders:^[60,61] (i) the Disease-Specific Pathways (DSP) model; and (ii) the Non-Specific Vulnerability-Stressor (NSVS) model. The DSP model is based on analyses of the specific pathway(s) leading to eating disorders. It assumes that eliminating specific risk factors for eating disorders will reduce the incidence of these disorders.^[13] The NSVS model assumes that there is a non-specific relationship between life stress, lack of coping skills, lack of social support and the development of

psychiatric disorders.^[60] The efforts of the NSVS model are not focused on the modification of specific eating disorder risk factors but concentrate on helping students to develop general life skills to cope with stressful events. In practice, a varied combination of components derived from the two paradigms has often been used, although most eating disorder prevention programs select one or the other of the two paradigms. Table IV describes the principal components of the DSP and NSVS models.

The first generation of prevention programs adopted an information-based approach (didactic) to prevention that focused on topics related to nutrition, body image and eating disorders.^[62] This type of approach is useful in increasing patients' and families' knowledge of eating disorders but has been ineffective in modifying unhealthy attitudes and behaviors (see section 4.3.1).

The second generation of prevention programs introduced an interactive and experientially educational approach and other strategies designed specifically to change dysfunctional attitudes and unhealthy behaviors. The dissonance-based approach, for example, employed a series of verbal, written, and behavioral exercises encouraging participants to criticize the thin-ideal with the goal of inducing cognitive dissonance that would lead them to change their beliefs, attitudes, and behaviors.^[15,63] Other examples include cognitive restructuring techniques to challenge negative cognitions about shape and weight,^[21-23] active techniques to foster a change in eating habits, including self-monitoring,^[21] messages on video to dissuade against dieting,^[64] prevention videotape on dieting and body image,^[65] and Internet-based multimedia prevention programs based on psychoeducational self-help materials.^[66-68] And, finally, some authors have introduced a new approach to the prevention of eating disorders, totally eschewing any attempts to increase diet and nutrition knowledge and focusing their effort entirely on efforts to "improve body image by building general self-esteem".^[26,69]

4.3 Update of Current Research

This research update focuses exclusively on school-based eating disorder prevention programs that have been evaluated in controlled trials and published in scientific journals or books. This includes studies in which students are randomly assigned to an intervention program or to a waiting list or to a measurement-only control condition as well as studies in which matched controls are used in a quasi-experimental design. Trials that did not test whether the change in outcome measures was significantly different in the experimental group versus the control group were not considered.

Two procedures were used to find relevant publications. First, a search was performed on Medline and PsychInfo for the years

1985–2002 using the following keywords: eating disorders, anorexia nervosa, bulimia, prevention and preventive. Secondly, experts in eating disorder prevention research were contacted and asked for copies of previous review articles.

A total of 68 titles were identified by this search. Thirty-nine studies were excluded as they did not use a randomized controlled trial method. The following section reviews 19 universal and ten targeted school-based eating disorder prevention programs that have been evaluated in controlled trials. This review considers universal programs to be interventions delivered to ‘all participants’ in intact classrooms and targeted programs to be interventions that screened participants for a risk factor. Studies that used certain screening strategies (e.g. advertisement for body acceptance) were also considered to be targeted programs since it has been demonstrated that participants who self-select programs designed to improve body acceptance or eating disturbances typically show higher eating disorder risk factors (e.g. body dissatisfaction).^[58] Table V summarizes the main components and findings of the trials reviewed in this paper. The table is divided into two

Table IV. Principal features of the Disease-Specific Pathways (DSP) model and the Non-Specific Vulnerability-Stressor (NSVS) model in eating disorder primary prevention programs^a

DSP model

Promotion of nutrition and exercising for healthy weight control

Promotion of skills for analyzing, resisting, and combating eating disorder social risk factors (e.g. pressure to diet)

Education on the nature and dangers of calorie-restrictive dieting and on the nature and dangers of eating disorders

Promotion of skills to resolve specific developmental challenges (e.g. the conflict between normal pubertal weight gain and living in a society that idealizes thinness)

NSVS model

Promotion of nutrition and exercising as part of a healthier lifestyle

Promotion of life skills to cope with general stressful events of life

Education and promotion of critical thinking about the meaning and social construction of gender

Promotion of skills to improve general self-esteem and a sense of competence

Features shared by DSP and NSVS models

Promotion of the natural diversity of weight and shape

Emphasis on the socio-cultural and developmental factors

Value on cultural literacy (e.g. training students to understand, critique and resist unhealthy messages from the media)

Promotion of life skills to strengthen the individuals against potential factors contributing to development of eating disorders.

a This table synthesizes the Levine and Piran description of the DSP and NSVS models.^[59]

sections: universal programs and programs targeted at high-risk participants.

The main goal of primary prevention programs is to modify the overall prevalence of eating disorders in the population. This goal has not been evaluated because the low incidence and prevalence rate requires a large sample size and the large range of age of onset of full-syndrome eating disorders requires a long-term follow up. For this reason, up to now, school-based eating disorder prevention programs have only evaluated short-term limited outcomes such as improvements in knowledge of eating disorders and related topics (e.g. dieting, biological regulation of bodyweight, healthy weight control behaviors, body image), improvements in attitudes (e.g. body dissatisfaction, concerns regarding eating, weight and shape, negative affect, perfectionism), and improvements in behaviors (e.g. dieting). In the interpretation process of the results of a school-based eating disorder prevention program, it is important to emphasize the fact that a significant reduction of dysfunctional attitudes and dieting in a population is an important health goal; however, this change does not necessarily translate into a significant reduction in the prevalence rate of eating disorders. Only a small minority of those who engage themselves in a diet go on to develop an eating disorder, and it is yet to be proven that reducing the prevalence of dieting and related behaviors will result in a decrease in the incidence of eating disorders.^[45]

4.3.1 Summary of Effects

Two general aspects of school-based prevention programs examined in this review appeared to be related to positive program outcomes.

The first aspect was that targeted prevention programs generally obtained more positive results than universal programs. Universal programs achieved their knowledge acquisition goals. All 10 universal studies that measured knowledge acquisition reported significant differences between experimental groups and control groups. The effects of universal programs on attitudes produced modest effects: only 5 (26.3%) of the 19 universal programs that measured attitudes modification found a significant difference between experimental and control groups on at least some of the measures during termination or follow up.^[21,23,26,65,69] Changes in attitudinal measures also tended to show contradictory findings, e.g. improvement in body image but not in drive for thinness; improvement in eating concern but not in bodyweight and shape concern. The preventive effect of universal programs on improvements in behavior remains elusive; transitory positive behaviors, which disappeared during follow up, were observed in only 2 (11.1%) of the 18 universal studies that evaluated this outcome measure.^[21,27] In one universal study positive behavioral effects were observed only in the lower-risk group.^[24]

Table V. Studies evaluating school-based, controlled eating disorder prevention programs^a

Study	Country	No. of participants	Mean age (y)	Duration of program (h)	Follow-up (mo)	Focus (didactic or interactive) ^b	Improvements in knowledge	Improvements in at least one attitude	Improvements in at least one behavior
Universal programs									
Killen et al. ^[13] (1993)	US	931 f	12.4	15	24	Didactic	Y	N	N
Moreno & Thelen ^[70] (1993)	US	104 f	13.7	0.5	1.0	Didactic	Y	–	–
	US	115 f	13.8	0.5	1.0	Didactic	Y	–	–
Paxton ^[71] (1993)	Australia	136 f	14.1	10	11	Interactive	–	N	N
Neumark-Sztainer et al. ^[27] (1995)	Israel	269 f	15.3	10	24	Interactive	Y	N	Y
Mann et al. ^[72] (1997)	US	113 f	17.9	1.5	4.0	Didactic	–	N	N
Buddeberg-Fischer et al. ^[18] (1998)	Switzerland	314 (205 f, 109 m)	16.1	4.5	3.0	Didactic	–	N	N
Smolak et al. ^[14] (1998)	US	222 (120 f, 2 m)	10.0	8.0	2.0	Didactic	Y	N	N
Smolak et al. ^[73] (1998)	US	266 (129 f, 137 m)	9.0	8.0	0	Didactic	Y	N	N
Martz & Bazzini ^[74] (1999)	US	114 f	19.0	1.0	1.0	Didactic	–	N	N
Santonastaso et al. ^[24] (1999)	Italy	308 f	16.1	16	12	Interactive	–	N	N
O'Dea & Abraham ^[26] (2000)	Australia	365 (295 f, 170 m)	12.9	10	12	Interactive	–	Y	N
Phelps et al. ^[75] (2000)	US	530 f	12.0	6.0	0	Interactive	–	N	N
Dalle Grave et al. ^[23] (2001)	Italy	106 (61 f, 45 m)	11.6	12 + 4.0	6–12	Interactive	Y	Y	N
Nicolino et al. ^[76] (2001)	US	85 f	18.9	1.0	1.0	Interactive	–	N	N
Stewart et al. (2001) ^[21]	UK	752 f	13.4	4.5	6.0	Interactive	Y	Y	Y
Varnado-Sullivan et al. ^[77] (2001)	US	157 f	12.0	2.5	0	Interactive	–	Y	N
	US	130 m	12.0	2.5	0	Interactive	–	N	N
McVey & Davis ^[12] (2002)	Canada	263 f	10.9	5.0	12	Interactive	–	N	N
Steiner-Adair et al. ^[69] (2002)	US	499 f	12.5	6-12	6	Interactive	Y	Y	N
Withers et al. ^[65] (2002)	Australia	218 f	13.0	0.3	1.0	Didactic	Y	Y	–
Targeted programs									
Kaminski & McNamara ^[78] (1996)	US	29 f	18.3	12	1.0	Interactive	–	Y	Y
Franko ^[79] (1998)	US	19 f	–	12	0	Interactive	–	Y	N

Continued next page

Table V. Contd

Study	Country	No. of participants	Mean age (y)	Duration of program (h)	Follow-up (mo)	Focus (didactic or interactive) ^b	Improvements in knowledge	Improvements in attitude	Improvements in at least one behavior
Winzelberg et al. ^[66] (1998)	US	57 f	19.7	5.0	3.0	Didactic	N	Y	-
Cello et al. ^[67] (2000)	US	76 f	19.6	5.0 + 4.5	6.0	Interactive	-	Y	Y
Stice et al. ^[15] (2000)	US	30 f	18.0	3.0	1.0	Interactive	-	Y	Y
Winzelberg et al. ^[60] (2000)	US	60 f	20.0	5.0	3.0	Didactic	-	Y	-
Baranowski & Hetherington ^[20] (2001)	UK	29 f	11.5	7.5	6.0	Interactive	-	N	Y
Zabinsky et al. ^[68] (2001)	US	62 f	19.3	5.0	2.5	Didactic	-	Y	-
Stice & Ragan ^[16] (2002)	US	66 f	21.0	33	0	Interactive	-	Y	Y
Stice et al. ^[81] (2002)	US	148 f	17.4	3.0 (Diss) 3.0 (Health)	6.0 6.0	Interactive Interactive	- -	Y Y	N N

a The table reports any positive program effects regardless of whether they occurred at termination or a subsequent follow-up assessments.

b Didactic means an information-based approach. Interactive means interactive exercises.

Diss = dissonance intervention; **f** = females; **Health** = health weight management intervention; **m** = males; **N** = no significant improvement on any of the dependent variables; **Y** = significant improvement on at least one dependent variable; - indicates that this result was not examined in the trial.

Most of the targeted programs evaluated in this review reported, on the contrary, positive effects both on attitudes and behaviors. Ten (90.9%) of the 11 targeted programs found a significant difference between experimental and control groups on at least some attitudes,^[15,16,66-68,78-81] and 5 (62.5%) of the 8 targeted programs that measured behavior modification observed a positive significant effect on the outcome measure.^[15,16,20,67,78]

Three main reasons could explain the poorer results observed in the universal programs compared with the targeted programs:^[58]

1. The targeted programs mainly involved older participants (>16 years of age), while most universal intervention programs involved younger participants (<16 years of age). Since it is less likely that students engage in weight control behaviors or display significant eating disturbances at a younger age (11–12 years),^[23,58] it is difficult to achieve statistically significant decreases in these behaviors and attitudes.
2. The unselected participants (in the universal programs) may not be sufficiently motivated to fully engage in the prevention program.
3. Although most of the school-based prevention programs have not systematically used cognitive behavioral strategies, they do often include cognitive restructuring strategies. This procedure may not be appropriate with younger children and may be a partial explanation for the failure of universal programs that have targeted a younger population.

Despite the poor results seen with universal programs, some positive effects on participants at high risk for eating disorders were observed in four universal programs.^[13,18,21,26] In the study by Killen et al.^[13] a change in body mass index was observed in the high-risk group (who were characterized by high level of weight concern), but not in the full sample. Buddeberg-Fischer et al.^[18] found a positive improvement in physical symptoms among females with initial high eating disturbance levels, but not in the full sample. O’Dea and Abraham^[26] observed that the effect on body dissatisfaction persisted longer in the high-risk group compared with the full sample. Stewart et al.^[21] found greater decrease in dietary restraint in participants who initially displayed high levels of this measure. Two studies found that the effect of intervention was stronger in the lower risk group.^[24,75] These anomalous results could have resulted from the fact that the sample sizes for the high-risk groups in these two studies were particularly small.^[58] More pronounced positive effects for body dissatisfaction in participants with high body image disturbance levels were observed with targeted programs.^[67,80]

It is important to point out that the choice of assessment methods for detecting individuals at high risk for developing eating disorders varied from study to study. For example, Buddeberg-Fischer et al.^[18] considered high-risk individuals to be

those with a total score ≥ 10 on the 26-item version of the Eating Attitude Test self-report questionnaire. Killen et al.^[13] considered high-risk individuals to be those with a score > 57 on a new self-report measurement of weight concern. To detect high-risk individuals, O'Dea and Abraham^[26] used self-perception profile scores in the lowest percentile (Global Self-Worth of < 2.6) and trait anxiety scores on the State-Trait Anxiety Inventory of ≥ 31.9 for males and of ≥ 35.0 for females. Different risk status assessment methods hinder comparisons between the studies because individuals considered as high-risk in one trial do not necessarily have the same characteristics as individuals considered high-risk in another trial.

The second aspect of school-based prevention programs that was derived from studies that were examined in this review was the fact that universal didactic interventions produced fewer positive effects than universal interactive interventions. Universal didactic interventions produced changes in knowledge acquisition but only one (11.1%) induced a modest change in attitudes at termination, but not at follow up. In contrast, 5 (41.6%) of 12 interactive universal programs obtained a significant improvement in attitudes. This observation adds further evidence to the conclusions by prevention researchers in other areas that psycho-educational didactic interventions are less effective than interventions that actively engage students and teach new skills.^[82] Unfortunately, we do not have enough data to evaluate which elements of delivery methods (including who delivers the intervention and the format of the message) are most effective with different age groups.

Promising results in terms of changing dysfunctional attitudes with interactive universal interventions could also be partly attributed to the new strategies employed in these programs. Most successful interactive programs, in fact, used specific techniques to change dysfunctional attitudes and behaviors. Examples include cognitive restructuring techniques to challenge negative cognitions about shape and weight,^[21-23] the food diary to change eating behaviors^[21] and strategies to improve general self-esteem.^[26]

At present, we do not have sufficient data to conclude whether the specific contents of the programs we have reviewed have positive effects on attitudes and behaviors. The number of procedures and techniques used in the programs varied considerably as did the overlap between programs with positive and negative outcomes. In addition, theorists have long advocated the need to include some ecological elements in interventions in order to change the attitudes and behaviors of parents, teachers, and other significant adults and to transform the toxic influence of the media, however, none of the studies reviewed in table V, with the possible exception of Neumark-Stainer et al.,^[27] did this in any depth. The role of the ecological approach to eating disorder

prevention therefore warrants further attention. Some promising results were obtained at a ballet school in a non-controlled eating disorders prevention study, which truly adopted an ecological and participant approach.^[11] And, finally, since qualitative data are rarely used to evaluate outcomes, it is impossible to determine the significant influence of certain aspecific factors (e.g. the type of relationship established by students with stakeholders during the prevention program) on results.

Although most of the prevention efforts focused on adolescent girls, six universal trials included both boys and girls.^[14,18,23,26,73,77] Unfortunately, five of these six studies did not differentiate the gender difference in moderating intervention effects.^[14,18,23,26,73] Thus, it was not possible to draw any conclusions regarding the effects of participants' sex on intervention effects. It is, however, important to note that the one study that analyzed the intervention effects separately for boys and girls produced stronger effects for girls.^[77]

An interesting observation was that the length of the program was only weakly associated to positive outcomes; some very long interventions^[13] produced no changes in attitudes and behaviors while other short interventions^[15,65-68] had significant effects on the outcome measures.

5. Implications for Stakeholders in the Healthcare Sector

Some practical implications for stakeholders in the healthcare sector can be suggested from results obtained by school-based prevention programs.

Firstly, there is currently no statistical evidence that suggests that the prevention programs for eating disorders in schools included in this review have any harmful effects. This conclusion was also confirmed by two recent reviews on eating disorder prevention interventions.^[58,83] The possibility that strategies for preventing eating disorders might do more harm than good was brought up by a non-controlled study,^[84] which found that the level of dietary restraint in students was significantly higher at follow up than at the beginning of the study. However, the absence of a control group in this study makes it impossible to determine whether the increase was due to the effects of the program itself or whether it was due to developmental or social factors. In contrast, however, a subsequent controlled study performed by the same team and using the same program as the non-controlled trial^[84] did not find any harmful effects.^[21] Mann et al.^[72] observed that, at a 3-month follow up, intervention participants had slightly more symptoms of eating disorders than did controls. However, the researchers found no evidence of any program effects in either a positive or negative direction when they analyzed the follow-up

date controlling for the initial level of outcome measures.^[58] O'Dea and Abraham^[26] observed at a 12-month follow up, a 9% increase in dieting to lose weight in the intervention group but found no statistically significant differences compared with the control group. While there is no conclusive statistical evidence that prevention programs have harmful effects, a number of prevention efforts have noted a worsening of risk factors in a subgroup of individuals.^[25,26] This suggests that there is a need to articulate more systematic approaches to assess and minimizing any potential negative effects of preventive interventions.^[85]

Secondly, the promising results from targeted prevention programs for high-risk individuals might encourage stakeholders in the healthcare sector to promote targeted prevention programs for individuals of middle-to-late adolescent age groups who are at high risk for eating disorders. Common targets of these programs include a reduction of dietary restraint (in normal weight individuals) and a reduction of excessive concern over weight and shape. However, case-control study findings by Fairburn et al.^[52-54] suggest that prevention programs should also target some generic risk factors (e.g. negative self-evaluation, and perfectionism). Good results have been obtained with simple targeted programs, such as psycho-educational interventions that are easy to disseminate and may be delivered in groups or in the classroom. Since targeted programs have the intrinsic potential to produce stigmatization in participants, future research is needed to develop models and strategies to avoid this undesirable effect. Some recent technology-based efforts (CDs, Internet-based homework, guided chat rooms) may help to solve these problems.^[66] These innovative and technological approaches could be useful in implementing prevention programs in a cost-effective manner, and in maintaining confidentiality and anonymity. These issues are important to individuals at high risk of developing an eating disorder as they often delay the search for help because of feelings of shame and the desire for secrecy.^[68]

Thirdly, the poor results obtained with universal eating disorder prevention programs in young adolescents, as evaluated in controlled trials,^[12-14,73,75,77] must not discourage stakeholders in the healthcare sector from promoting universal eating disorder prevention programs. Since some clinical cases do derive from low-risk groups, research on universal prevention should continue and schools remain important places in which this type of study is possible.^[59] Partial positive results obtained by second generation universal prevention programs indicate that it is possible to obtain, in a universal sample, a significant improvement in some dysfunctional attitudes by adopting an interactive and experimental educational approach and some specific strategies. Unfortunately, the preventive effect of universal programs on improvements in weight-related behavior remains minimal. In designing a universal

prevention program it is mandatory to place more emphasis on behavioral changes by including a stronger link between knowledge and attitudes and behaviors.^[69] One strategy to obtain a behavioral change would be to stimulate an activism component, encouraging participants to take what they learned in the program out into the world of their family and peers.^[86] As eating disorders are a culturally-mediated phenomena it is also fundamental to include parents, teachers, school administrators, and advertisers in efforts to challenge the cultural pressure of thinness in adolescents.^[69,86]

In conclusion, based on the experiences of many authors^[59,69,86] and on those of the author of this review, the following suggestions are made to stakeholders in the healthcare sector to optimize implementation and evaluation of school-based eating disorder prevention programs:

- the program must be easily inserted in the context of the school hours (e.g. taught within school hours) with lessons no longer than 50 minutes;
- facilitators of the program should be extensively trained before beginning the interventions;
- the program should be written in a manual to facilitate intervention fidelity and dissemination;
- program fidelity should always be evaluated, especially if the intervention is located far from the research team. To enhance fidelity it is helpful to record the intervention and to have a supervisor who evaluates several recorded prevention sessions;
- in order to eliminate possible contamination effects, is advisable to use a control group in a separate site;
- the administration of the program should include a wide spectrum of people with the involvement of parents, teachers and school administrators;
- booster sessions should be routinely planned to reinforce the efficacy of the prevention program;
- programs should select quantitative and qualitative outcome measures to match the goals of the program, including instruments for evaluating potential negative effects. For example, a program used for 8 to 10-year-olds cannot reasonably demonstrate prevention effects until the individuals are at least 12–14 years old; and
- short-term (6 months) and long-term (1 or more years) follow up assessments should be routinely conducted in prevention research.

6. Potential for Future Research

Modest results from universal eating disorder prevention programs largely depend on the fact that the knowledge of risk factors for eating disorders is lacking or, at best, incomplete, and that we

have yet to develop effective methods for manipulating the identified risk factors listed in table II. While we wait for a greater understanding of the etiology of eating disorders, research can still be done to try to improve the results from eating disorder prevention programs.

6.1 Enhancing Reliance on Risk Factor Research

Most of the school-based prevention programs evaluated in this review were designed without being guided by recent research on risk factors (e.g. retrospective case-control studies and prospective cohort studies). The early prevention programs, for example, focused on providing information about eating disorders although a lack of knowledge about eating disorders has not been identified as a risk factor for the development of these disorders.^[58] Other interventions have tried to reduce putative risk factors that have not yet been validated by recent research on risk factors and that have not yet been found to predict the development of eating disorders (e.g. attempts to promote communication skills, coping skills, or media literacy).^[58]

Even though there are some risk factors for eating disorders that are yet to be established with confidence, it would seem rational that future prevention programs will be designed to target empirically established risk factors. Likewise, it is important to develop new instruments for defining and detecting high-risk individuals based on current risk factor research. If researchers assessing the prevention of eating disorders are able to integrate advances in basic scientific research on the etiology of such disorders into their theories and programs it is probable that prevention efforts will have better outcomes.

6.2 Overcoming the Methodological Limitations of the Eating Disorder Prevention Trials

This review found a number of methodological limitations in studies that assessed the prevention of eating disorders. Many prevention trials – not evaluated in this review – did not include a control group. Without this condition it is impossible to distinguish intervention effects from the effects of passing time. Most prevention trials did not use randomization methods to assign participants to intervention and control conditions. In many cases sample sizes and follow-up durations were inadequate for any meaningful conclusions to be made. Only few prevention trials^[20,76] utilized a placebo control condition. Without a placebo control group it is impossible to rule out the possibility that observed decreases in outcomes may be due to demand characteristics or expectancy effects.^[58]

In most studies, outcome measures were based on self-report assessment questionnaires. Such instruments tend to overestimate

psychopathology and are not an ideal way to assess eating disorder features. Furthermore, as was explained in section 4.3, outcome measures evaluated only changes in certain attitudes and behaviors and not the real effect on the prevalence and the incidence of eating disorders. Finally, many studies had statistical limitations and did not conduct appropriate inferential testing of intervention effects (e.g. repeated-measure ANOVA models) and almost no trials reported the effect sizes (e.g. explained variance). Research methodology must be enhanced in order to improve the assessment of progress in prevention trials. Future trials should strive to: (i) specify the goal, theoretical basis, rationale, and target population of each intervention strategy and (ii) employ experimental designs with randomization, placebo control condition, good psychometrics, fidelity, and adequate follow-up durations to evaluate both short-term effects and true prevention effects.^[86]

6.3 Improving Standard Protocols for Evaluating Outcomes

The development of a standard protocol regarding reliable risk factors, outcome measures, and follow-up intervals will facilitate comparisons between studies.^[83] Since few risk factors for eating disorders have been well demonstrated and since recent risk factor research suggests that dieters are most likely to develop eating disorders,^[52] it would be ideal if individuals who diet were routinely evaluated when analyzing prevention program outcomes.^[83]

Regarding the choice of outcome measures, the most commonly used measures are body mass index (BMI), the Eating Attitude Test (EAT),^[87] and the Eating Disorders Inventory (EDI).^[88] However, all three of these measures have many limitations when applied to the field of prevention. BMI increases with age and is not very relevant to the prevention of bulimia nervosa. EAT and EDI are useful instruments for a clinical population but not for non-clinical samples.^[83] Some authors suggest that the Weight Concerns screening tool developed by Killen et al.,^[13] a simple instrument that contains items assessing the importance of weight, worry about weight, fear of weight gain, recency of last diet and feeling fat, could be a more useful tool for outcome measurement in future research.^[83] This instrument is an optimal estimator of risk status of eating disorders with a sensitivity of 86% and specificity of 63%.^[13]

Longitudinal studies with long-term follow-up (≥ 1 years) will be very helpful in examining the ongoing effects of intervention measures, especially in younger individuals. Finally, it would be useful during follow up to evaluate the number of individuals with eating disorders using confirmatory semi-structured interviews.^[83]

6.4 Evaluating the Effectiveness of New Ideas and Paradigms

Some theorists have suggested that prevention interventions must target younger individuals before schemas on bodyweight and shape are completely developed.^[14] In addition, interventions with children and young adolescents must always include a developmental perspective approach.^[89] Tailoring lessons to the development level of children and young adolescents is much more than 'making lessons fun' or 'translating adolescent lessons using non complicated words'.^[90] It implies designing a program with contents and strategies suited for the age of the students. For example, certain topics (e.g. self-induced vomiting) should be entirely avoided because this information leads children and young adolescents to learn dangerous behaviors without developing, as consequence of their egocentrism, any concern about the long-term harm of these behaviors.^[90] Other topics seem more consonant with the concrete cognitive operations of children or young adolescents (e.g. fat deposit as a fact of pubertal development, nutritional needs of older children who want to become strong in sport, and the development of competence rather than relying on physical attractiveness as a primary measure of self-worth).^[90] In addition, social comparison seems a limited process in mid-childhood and the component of self is less well-organized and more connected with situations.^[89] These findings can be used by parents and teachers to help children to avoid comparisons with images of thin fashion models and peers and to develop a self-evaluation schema that is not based on excessive control of eating, bodyweight and shape.

More research is warranted to understand the strengths and weaknesses of the two principal paradigms (DSV and NSVS) used in preventions programs for eating disorders with the aim of achieving preventive effects. Both paradigms seem to have advantages and disadvantages. The DSV paradigm, which directly refers to eating disorders and associated behaviors, may potentially introduce young people to dangerous practices by providing information about unhealthy weight control behaviors (starvation, vomiting, laxative misuse).^[26] The NSVS paradigm, which helps individuals develop general life skills to cope with stressful events of life, may be too broad to manipulate some specific eating disorders risk factors. It then seems reasonable for future prevention programs to adopt strategies that target both eating disorder risk factors and stressful life events that are associated with the onset of eating disorders,^[21] thus eliminating some potentially dangerous weight controlling behaviors (e.g. by providing information about such behaviors).

Other theorists have advocated the use of a new paradigm for the prevention of eating disorders. The Participatory-Empower-

ment-Ecological-Relational (PEER) model^[11,61,91] shares important features with the DSV and NSVS paradigms (e.g. concerns about the unhealthy tension between natural bodyweight and shape diversity and the standardized and idealized images of thin media celebrities), but it departs radically from the DSV and NSVS paradigms by describing adolescents as the ultimate authorities on their bodies and attitudes. According to the theorists of the PEER model, the scarce results obtained by previous universal programs were, in part, due to the top-down approach used in these models, whereby experts (psychologists, teachers) transmitted information and skills to students. The PEER model, on the contrary, is child- or adolescent-driven and knowledge is constructed in dialogues among adolescents with adult mentors. This knowledge is then used to transform the social environment, including peer norms, school policies, curricula and administrative structures. An ecological participatory approach has also been advocated by the WHO's model of a Health Promoting School.^[92] This model describes the development of context-specific, school-based programs through a participatory process of dialogue with all stakeholders, including parents, teachers, school administrators, students, health professionals, and other community members.

Feminist theorists have suggested that prevention programs should be based on the literature on girls' psychological development and girls' way of learning.^[59] These authors emphasize the fact that females learn all subjects best with a relational model of teaching,^[93,94] and therefore prevention interventions should be based on an interactive and relational learning approach with someone (preferably female) who listens, teaches and models alternative healthy choices.^[59] Feminist prevention approaches also hold the role and the responsibility of adults to be very important in children's lives and therefore advocate the education of parents and teachers.^[55]

Most of the prevention programs reviewed in this article were designed for use with only girls, but there may be at least two general arguments for developing interventions to also include boys. First, binge eating disorders, an atypical eating disorder, is also commonly diagnosed in males.^[50] Second, most schools in the Western world have classrooms with both females and males and there could be advantages in encouraging communication between the sexes on typical issues developed in prevention programs. Males, for example, can play a significant role in reducing the social pressures on women to be thin and beautiful; pressures that promote body dissatisfaction, restrictive diets, and other factors implicated in the development of eating disorders in individuals who are of normal weight.^[22]

Randomized and controlled trials are necessary to validate the effectiveness of these new ideas and theories on eating disorder prevention.

6.5 Translating the Findings of Basic Research

One of the recommendations of a roundtable meeting on the prevention of eating disorders convened by the National Institute of Health in the US on April 25, 2000 was that the field of eating disorder prevention would benefit from translation and application of basic research in this area.^[85] One example is trying to translate social psychology field findings on how certain individuals perceive media advertisements or public health messages with regard to overeating or undereating.^[85] Another area suggested for consideration is the applicability of animal models of ingestive behaviors.^[85] Anorexia in animals, for example, sometimes results from the impact of homeostatic challenges (e.g. dehydration) on the neural control networks that can stimulate, inhibit, or disinhibit specific behaviors, or from cognitive influences (e.g. stress).^[95] The study of animal models could help to improve our understanding of the influence of social, emotional, and cognitive factors on the neural control network component in humans.

6.6 Importing Strategies from Preventative Measures for Other Disorders and from the Treatment of Eating Disorders

Some strategies to improve the effectiveness of eating disorder programs can be learned from other prevention fields (e.g. depression, substance abuse). For example some psychosocial interventions have proven to be effective in reducing the risk of depression in offspring with depressed parents, regardless of the basis for risk factors (genetic or learning).^[85] To date, there have been no trials targeting the offspring of parents with eating disorders; this could be an area of future targeted prevention research.^[85] Another important lesson taken from methods used to treat substance abuse is that it is necessary to develop and maintain certain levels of intervention potency in order to obtain effective intervention.^[85]

Another field where researchers assessing the prevention of eating disorders can learn some useful strategies is the self-help approach with books. This approach has shown interesting and positive effects in the treatment of bulimia nervosa and binge eating disorder.^[96,97] Self-help books may be used either by individuals on their own (pure self-help) or in combination with guidance and support from therapists who may, or may not, be non-specialists (guided-self-help).^[98] The contents of some self-help books^[99,100] are derived from cognitive behavioral therapy of bulimia nervosa, the most effective therapy evaluated by controlled trials.^[101] Self-help with manuals uses some effective strategies to increase an individual's motivation to change, to decrease dietary restriction and to reduce excessive control on eating, body weight and shape. To date, prevention trials, with a few exceptions, have neglected the importance of increasing the motivation

of participants in the intervention and have not systematically used cognitive behavioral strategies to reduce dietary restriction and excessive control over eating, bodyweight and shape. Positive effects would be expected from an intervention that is targeted at high-risk individuals and uses some strategies taken from the self-help manual approach.

6.7 Evaluating the Possibility of Integrating Eating Disorder and Obesity Prevention Programs

Risk factor studies indicate that it may be inaccurate to view eating disorders and obesity as distinct entities. These conditions can co-occur and, in some cases, individuals pass from eating disorders to obesity or vice versa. Case control studies have shown that obesity is a risk factor for bulimia nervosa^[51] and binge eating disorders^[54] and binge eating behaviors are very common among persons with obesity.^[102] In addition to conceptual reasons there are at least two important practical reasons for integrating eating disorders and obesity prevention. One important reason is cost reduction; one intervention is obviously cheaper than two. The second reason is to eliminate potential conflicting messages on nutrition, physical activity and body image and their potential iatrogenic effects coming from programs delivered separately. That is, strategies aimed to prevent obesity, such as monitoring intake, might promote excessive concern over eating, and vice versa, strategies aimed at eliminating any form of restrictive diet may favor overeating and the onset of overweight.^[103] An integrated approach, balancing the importance of following a healthy lifestyle to avoid the development of obesity with the importance of accepting the genetic diversity of human bodies in order to avoid the development of eating disorders, is a challenge to be tested in the next generation of prevention trials.

7. Conclusions

School-based eating disorder prevention programs are still in their infancy. In the last 10 years, however, small, but significant, improvements have been made in developing and evaluating innovative interventions and some general implications for stakeholders in the healthcare sector can be suggested by the results obtained from the controlled trials evaluated in this review. Firstly, there is currently no statistical evidence that suggests that school-based eating disorder prevention programs have harmful effects on student attitudes and behaviors. Secondly, the positive results obtained from targeted programs might encourage the promotion of these interventions for individuals of middle-to-late adolescent age groups who are at high risk of eating disorders. Thirdly, positive effects have been achieved using an interactive and experientially educational approach. Fourthly, the poor results obtained

by universal eating disorder programs in young adolescents must not discourage stakeholders from promoting research on universal eating disorders prevention programs.

Efforts to improve results need to focus on a better understanding of risk factors that are most potent and amenable to change. A broad range of interventions is needed for further consideration. Promising results from the field of eating disorder prevention and from modern risk factor research could build a new generation of universal prevention trials for eating disorders without the methodological limitations seen in the current literature and with real effectiveness in achieving the goal of reducing the prevalence of eating disorders in the general population.

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