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Why may teenage girls persist in smoking?

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Teenage girls often smoke cigarettes, recognizing that it protects them from the impulse to binge eat with its feared weight-gain consequences. Evidence is marshalled from our studies of a female eating-disordered population, teenage females (London, U.K. and Ottawa, Canada) and middle-aged women (London and rural England) in the general population. Teenage female data analysis reveals links between smoking and body-weight/shape concerns. Those who smoked were likely to be moderately overweight. Smoking was also related at all ages to being postmenarchal. Sensitivity to shape is largely and qualitatively prompted by the development of body fat in puberty. Smoking by the London schoolgirls in particular also independently revealed an association with greater weight loss since puberty. Smoking was powerfully linked with vomiting undertaken as another defence against weight gain and may also be further reinforced as a behaviour by it. The eating-disordered population showed these latter associations most strikingly. Since smoking amongst older women is associated with below average body-weight it may indeed be effective in curbing weight gain and therefore promoting desired weight loss. Our studies provide little evidence of association between smoking and generalized or social anxiety. We propose that preventative psychological approaches to teenage female smoking should include attention to these matters.

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Introduction

During the course of this century the overriding cultural, social and economic constraints on women smoking tobacco in cigarettes have disappeared. For decades now, women have more or less been as free as men to smoke if they wished or needed to. Within this setting females, especially teenage females (Murray *et al.*, 1984; Bosanquet and Trigg, 1992; Foulds and Godfrey, 1995; Wechsler *et al.*, 1998) have come to smoke as commonly as their male counterparts, and increasingly to die from smoking related causes (National Cancer Institute of Canada, 1991).

Smoking is acknowledged to be multifactorially driven—often multiply so within an individual and differently so between individuals. Peer pressure, social bonding resulting from smoking and relief from social anxiety are considered major social factors in both sexes (Royal College of Physicians, 1992). Once physical and psychological dependence on cigarette/tobacco smoking has become established as the solution to such personal problems, any subsequent withdrawal/deprivation leads to mounting arousal, anxiety and preoccupation with the need to smoke. The addiction is generated.

However, are there sex differences in terms of motivation to smoke? The research-based literature has noted the apocryphal ability of cigarette smoking to curb weight gain. This

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latter is predominantly a female concern. Such literature has largely been ignored whenever preventive programmes for smoking have surfaced in the U.K. They have often failed generally (Wechsler *et al.*, 1998), but especially with respect to teenage females (Calman, 1995).

In this article we consider the evidence for an important association between body-weight/shape concerns and smoking in females. Results from some of our earlier studies, concerned with relatively young female "eating-disorder" populations and with females of all ages in the general population, are brought together with those from our two more parallel studies, one in the U.K. and one in North America, specifically concerned with teenage female smoking.

Smoking and "eating disorders"

Sufferers from eating disorders are characterized by their major concerns with body-weight and shape. Anorexia nervosa sufferers in particular relentlessly and desperately pursue thinness and, by thereafter maintaining body-weight below the pubertal threshold of about 7 stone/45 kg (for a female of average height), fearfully keep normal adult body-weight and its personal and social consequences at bay (Crisp, 1980). A strong association between smoking, alcohol consumption, and anorexia nervosa with a binge/vomiting form of this low body-weight control was reported amongst a clinic population of 60 patients (Crisp, 1967). It was suggested that smoking provided an alternative comfort/oral activity to eating in this clinical subset and was harnessed as an additional strategy in the battle against the cycle of bingeing, consequent weight gain and bloating, and yet more purging in the presence of immediately available food. The question arose as to whether this clinical finding might have wider relevance to smoking amongst more normal teenage females. We explored this further (Humphrey *et al.*, 1992) within the broader context of the membership of the U.K. nationwide Eating Disorders Association (EDA), a lay support organization for sufferers and their families. A postal questionnaire, addressing smoking practices and their relationship to body-weight concerns, listings of a broad spectrum of possible reasons for smoking and consequences of giving up smoking and also the Eating Disorder Inventory (EDI) — a standardized inventory addressing behavioural and social dimensions to anorexia nervosa in particular (Garner and Olmsted, 1984) — were completed by 879 female sufferers and ex-sufferers (age range 15–40 years).

Twenty per cent were regular smokers and one-quarter of these smoked more than 20 cigarettes per day. Smoking was less common amongst those labelled by us as currently "anorectic" (i.e. with BMI ≤ 17). Overall, smokers had been significantly heavier at their highest BMI ever and desired a lower BMI than non-smokers, such that there was a significantly greater gap between their mean present weight and their mean sought-after weight (Table 1).

Smoking was also significantly related to high scores on the bulimia subscale of the EDI and especially to the positive response to the question concerning vomiting as a chosen means of losing body-weight (Table 2).

The Interoceptive Awareness (IA) scale in the EDI measures "lack of confidence in recognising and accurately identifying and discriminating between emotions and visceral sensations of hunger and satiety". High scores on this scale correlated highly with

Table 1 *Body mass indices for smokers* vs. *non-smokers (eating-disorders population)*

	Smoker				
	Yes $n=247$		No $n=632$		
	Mean	S.D.	Mean	S.D.	p-value
Body mass index (BMI)	20·1	(4·0)	19·7	(4·5)	n.s.*
Lowest adult BMI	16·2	(3·3)	16·1	(3·6)	n.s.
Highest adult BMI	24·5	(4·3)	24·1	(5·2)	<0·05
Preferred BMI	18·7	(2·9)	19·0	(2·5)	n.s.

*n.s. = Not significant.

Table 2 *Eating disorder inventory scores (0–30 on eight scales)*

	Smoker				
	Yes $n=247$		No $n=632$		
	Mean	S.D.	Mean	S.D.	p-value
Interoceptive awareness	13·9	(7·2)	12·6	(7·5)	<0·05
Interpersonal distrust	7·7	(5·1)	7·3	(5·2)	n.s.*
Ineffectiveness	13·6	(7·3)	13·5	(8·3)	n.s.
Perfectionism	8·3	(5·0)	8·9	(4·9)	n.s.
Drive for thinness	14·3	(5·8)	13·9	(6·1)	n.s.
Bulimia	8·1	(6·3)	6·7	(6·1)	<0·01
Body dissatisfaction	18·0	(7·9)	17·2	(8·0)	n.s.
Maturity fears	5·9	(5·6)	5·1	(5·1)	<0·05
Vomiting question (Bulimia scale)	1·5	(1·3)	1·1	(1·3)	<0·0001

*n.s. = Not significant.

weight-control items on the smoking questionnaire, especially the statement "I smoke when I feel like binge eating", but also "Smoking makes me feel less hungry", and "Smoking controls my weight" (Table 3).

Equally, when the IA scale scores were examined in relation to perceptions of the consequences of giving up smoking (Table 4), those who most imagined putting on weight scored most highly. These scores also correlated highly with perceived "boredom" as an outcome of stopping smoking, a state of mind construed by the researchers as probably close to the major ennui experienced and reported by eating disorders sufferers when "out of control". Finally, those who were convinced that giving up smoking would definitely not make them healthier had the highest mean score on the IA scale, i.e. many were highly interoceptively "unaware".

Table 3 *Mean EDI interoceptive awareness scale scores by reasons for smoking*

	Yes, definitely	Not sure	No, definitely not	*p*-value
Instead of eating?	14·9	12·0	9·8	<0·01
Smoking relaxes you?	14·5	13·1	9·4	n.s.*
Something to do	14·8	12·3	13·3	n.s.
Orally comforting	15·4	12·9	11·4	<0·01
You are bored?	15·0	13·4	12·6	n.s.
Makes you less hungry?	15·8	12·7	11·1	<0·001
When you feel like bingeing?	16·4	13·0	10·0	<0·0001
To control your weight?	15·8	13·9	10·7	<0·001

*n.s. = Not significant.

When invited to indicate their reasons for smoking and their expectations of the consequences of giving up the following responses emerged.

Reasons for smoking (rank ordered) (% responding "YES definitely")

	%	
Instead of eating	70	Displacement activity
Smoking relaxes me	66	
Something to do	55	
Orally comforting	54	
Because bored	53	
Makes me less hungry	52	
When I feel like bingeing	50	
To control my weight	48	
I like smoking	47	
Goes with drinking alcohol	39	Social reasons
Makes me more socially confident	36	
My friends smoke	13	
Brothers/sisters smoke	3	
Someone I admire smokes	1	

Consequences of giving up smoking (rank ordered) (% responding "YES definitely")

	%	
I would be more healthy	86	
Family would be glad	82	
I would eat more	70	Personal reasons
Get bored easily	69	
Put on weight	40	
I would be less easy to get on with	39	
Would be more attractive to opposite sex	27	Social reasons
Help others give up/cut down	18	
Would be happier	14	
Would go out less	6	
Would be less popular with friends	3	

This association of smoking with proneness to bingeing amongst an eating-disordered population has been further confirmed recently (Wiseman *et al.*, 1998). Morgan and Lacey (1999) also report their study of a large eating-disorder population suffering exclusively from bulimia nervosa (regular frequent bingeing and purging at normal or above normal body-weight). Over 60% were smokers with a mean consumption of 19 cigarettes per day. Such

Table 4 *Mean EDI interoceptive awareness scale scores by perceived likely effects of giving up smoking*

	Yes, definitely	Not sure	No, definitely not	p-value
Be more healthy?	13·9	11·2	18·8	$<0·05$
Family would be glad?	14·1	13·0	16·1	n.s.*
Get bored easily?	15·5	10·6	9·9	$<0·0001$
You would eat more?	15·2	11·7	9·4	$<0·001$
Put on weight?	16·2	14·1	10·5	$<0·0001$

*n.s.=Not significant.

smokers were more likely to have a previous history of anorexia nervosa and to be currently also abusing amphetamines, cannabis and/or cocaine. The authors suggest that such smoking was probably consequent upon attempts urgently to regain control of the avoidant (e.g. BMI < 45 kg) stance of anorexia nervosa.

We conclude that, within a largely anorectic population, there are major associations between smoking and a relatively high former and present body-weight, a fear of otherwise binge eating and consequent weight gain, a pathologically sought-after low body-weight, poor ability to differentiate emotions from hunger and major underlying fears of the distress that uncontrollable weight gain would incur. Smoking is a major weight-control strategy for those within the population who are impulsively most at risk of unwanted weight gain (i.e. are bingeing uncontrollably) but, as a behaviour, is not otherwise overrepresented since the numerically larger "restricting" subgroup of anorectics smoke less commonly than others. Heavy smoking is very common within a population of normal-weight "bulimics", especially in those with a history of anorexia nervosa who probably feel most "out of control". In general, eating-disorder sufferers with bingeing as a feature of their disorder particularly exemplify the link between smoking and body shape concerns in the female.

General teenage female body-weight/shape concerns

Concern about normal pubertal female "fatness" and attempts to curb it are obviously not limited to eating disorder populations, though such disorders spill out of it and the attendant attempts at dieting, as a consequence of additional influences.

This concern is widespread amongst teenage girls who are biologically normal in terms of body-weight and shape and it lingers thereafter through adult life amongst a high proportion of women (Crisp, 1980). Around half of 16/17-year-old girls have been shown to have such major concerns over the last several decades both in the U.S.A. (Jourard *et al.*, 1955; Huenemann *et al.*, 1966) and Europe (Nylander, 1971; Crisp, 1985).

For instance, in 1971–1972 our own group examined 2000 London schoolgirls with respect to actual body-weight/shape, preferred weight and related concerns and behaviours (Crisp, 1985). In 1989–1990 we repeated this exercise with about 2000 other London schoolgirls and nearly 1000 Ottawa schoolgirls in collaboration with Canadian colleagues (Crisp *et al.*, 1998). Figure 1 shows mean measured body-weights/BMIs by age for the three populations. Statistically, there were highly significant variations ($p<0·0001$) between the three groups, particularly after the mid-teens, e.g. there is a relative dip in the mean body-weight of the

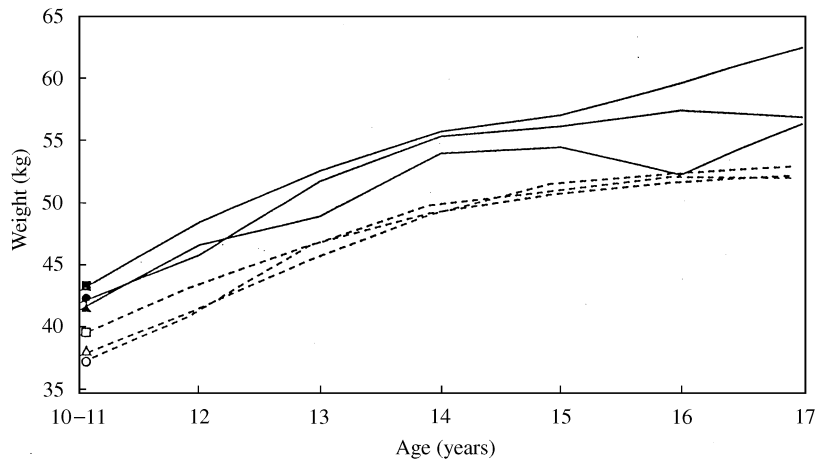

Figure 1. Actual (—) and preferred (– – –) mean body-weights, displayed in relation to age in years: (■, □) = the Ottawa population; (●, ○) = the London (present study) population; (▲, △) = the population studied in London in 1972. Reproduced from *Postgraduate Medical Journal* 1998, **74**, 473–479, with permission from the BMJ Publishing Group.

Table 5 *Preferred weight/BMI as a percentage of measured weight/BMI amongst schoolgirls feeling "fat"*

Age (years)	London, 1972	London, 1990	Ottawa, 1990
10–12	85·2	81·9	83·0
13	90·1	81·9	84·7
14	89·2	83·6	84·6
15	90·1	85·3	85·2
16	93·5	86·5	84·9
17+	91·5	88·3	82·0

1972 16-year-olds; the 17-year-old Ottawa schoolgirls appear relatively overweight. However, the levels of "preferred" body-weight are remarkably similar (i.e. not significantly different between these three large populations at any age) and the authors suggest that there is an enduring and time-honoured concern to achieve thinness amongst teenage females, which is linked to its pubertal threshold significance and the personal developmental challenges that such physical growth has provoked. The discrepancy between actual and preferred weight represents a tension for teenage females which can dominate their adolescence, often being perceived as the origin of their existential struggle as, driven by puberty, they attempt to secure a new personal and social identity in adult life. This tension (expressed as the percentage by which preferred weight is less than measured weight) varies with age (Table 5). It can be seen that the relative discrepancy between actual and preferred weights tends to diminish with advancing teenage years in all three populations except for the oldest of the Ottawa groups, who were characterized by being escpecially obese (Figure 1). Of course, the fact that this discrepancy is diminishing with age does not

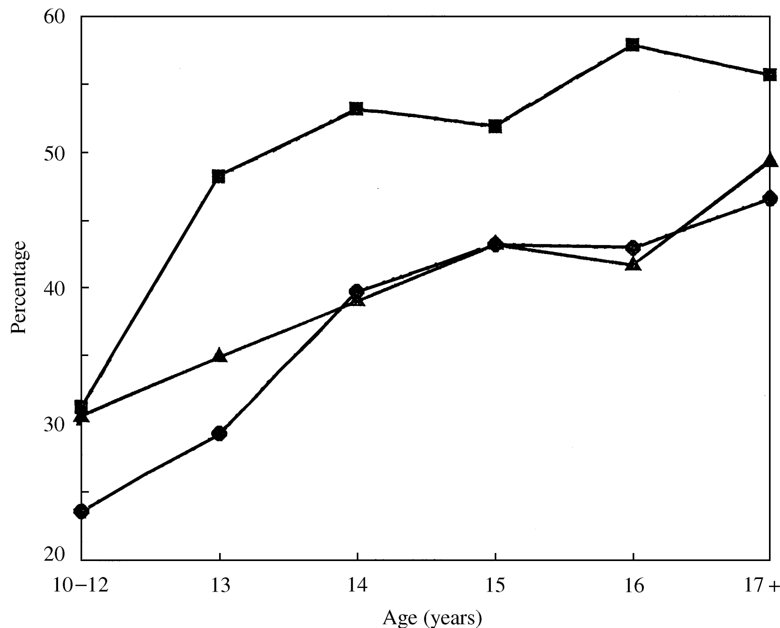

Figure 2. Proportion of girls who wished to be thinner displayed in relation to age. (■) = The Ottawa population; (●) = the London 1990 population; (▲) = the London 1972 population.

necessarily mean that it is less a source of distress. Clinical and survey experience suggests the contrary.

The large number of girls feeling "fat" in this way and wishing that they could lose weight seems to have changed very little over the 20 or so years (Figure 2) that separate the two London studies. A greater proportion of the North American schoolgirls wanted to be thinner at nearly all ages and this is consonant with their greater body-weight/higher BMIs. However, clearly the majority of teenage females who reported feeling "too fat" in these three studies were not very obese (Figure 3), supporting the idea that their concerns about their "fatness" relate importantly to that aspect of it which has been pubertally driven. It is also noteworthy that the 1972 London schoolgirls were just as likely to feel "too fat" at the age of 16 years (Figure 2), despite their relatively low actual weights, supporting the proposition that there were more low body-weight eating disorders around at that time. Meanwhile, the changing scene of "fashion", much to the fore in our present day media- and consumer-ridden society, is seen more as a commercially driven reaction to such perceived and persistent adolescent need than as a trigger (Crisp, 1980).

Smoking, body-weight and body-weight/shape concerns

A comprehensive review (Klesges *et al.*, 1989) of 70 studies on the relationship between body-weight and smoking behaviour in the general population bears out the long-held mythology and also the commercial belief in this association and its marketability in respect of cigarette sales (Action on Smoking and Health, 1986). Such studies often reveal that

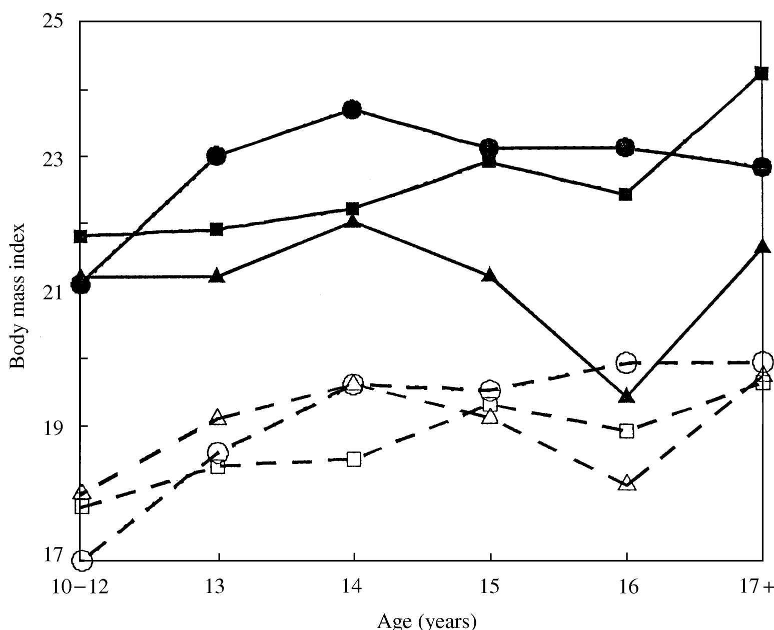

Figure 3. Mean actual (—) and preferred (– – –) body-weight displayed in relation to age for those girls who wished to be thinner. (■, □) = The Ottawa population; (●, ○) = the London 1990 population; (▲, △) = the London 1972 population.

adult smokers in the U.S.A. weigh less than non-smokers (Wack and Rodin, 1982; Fisher and Gordon, 1985), that stopping smoking leads to weight gain and starting it to weight loss and that females, including teenagers in Norway (Bjelke, 1971) and Ireland (Grube *et al.*, 1986), believe that smoking helps to curb their unwanted "fatness" (for which they take their body-weight as the main marker). Klesges *et al.* (1989) suggest that changes in diet and/or metabolism may underlie weight changes consequent on smoking. A major study reported from the U.S.A. (Williamson *et al.*, 1991) noted substantial weight gain in a minority of those who had stopped smoking, proposed that this cosmetic effect might hamper attempts to quit and recommended that such concerns be addressed as part of smoking cessation programmes. Jarry *et al.* (1998), studying (possibly relatively self-selected) females aged around 25–30 years, found the wish to curb weight to be just one major factor influencing smoking. Those who reported smoking and striving to diet and also those who reported being former smokers were amongst the heaviest subpopulations. Those who reported dieting as well as previous smoking had experienced the greatest weight gain upon cessation.

In contrast to these findings in adults, we reported that *smoking* was most common amongst U.K. *schoolgirls* who were *relatively overweight* (those between the 75th and 90th percentile for age) (Halek *et al.*, 1993). It was also significantly related to body-weight and shape concerns. This accords with the finding that overweight females in the U.S.A. (Klesges and Klesges, 1988) were especially likely to have taken up smoking as a method of weight control, and is supported by Townsend *et al.* (1991) who found that adolescent female smokers in the U.K. tended to be overweight. In our 1993 report we suggested that smoking may indeed be effective in reducing body size and shape over the years, since we had earlier

found it to be associated with *thinness* in both urban and rural dwelling healthy *older females* in the U.K. Our 1968 survey of a suburban London population aged 45–60 years (Crisp and Priest, 1971) had reported a relationship between obesity and low levels of anxiety and depression in men and low levels of anxiety in women (Crisp and McGuiness, 1976). In 1974, we screened a rural population aged 17–75 years in a similar way and found similar relationships, social-class related, in those aged 40 years and older, but these associations were not so evident in the younger female population wherein there was greater variability.

We subsequently amalgamated these two data banks from suburban London and the rural Cotswolds. The population sample numbered about 1400. We analysed it so as to be able to examine relationships between BMI (weight/height^2), mood (anxiety and depression scales of the Crown–Crisp Experiential Index (CCEI); Crown and Crisp, 1979) and tobacco and alcohol consumption (Crisp, 1986). Within this study individuals were characterized as smokers or non-smokers and as heavy, light or non-alcohol consumers. Figure 4 charts such behaviour against a background of a two-way plot of mood (anxiety) and Ponderal index (now generally called BMI). If women aged 40 years and over are examined, then those below the mean for BMI (25) are significantly more anxious than those above the mean and significantly more of them smoke (Figure 4). Smoking especially characterized those very thin older women who were more than 20% below the mean BMI and in this population there is a dense subcluster of such women also reporting very low levels of anxiety. Associations in the same direction in respect of alcohol consumption were not statistically significant. On the whole, smoking was significantly associated with high levels of anxiety and depression. For women aged 17–39 years there were no longer such powerful

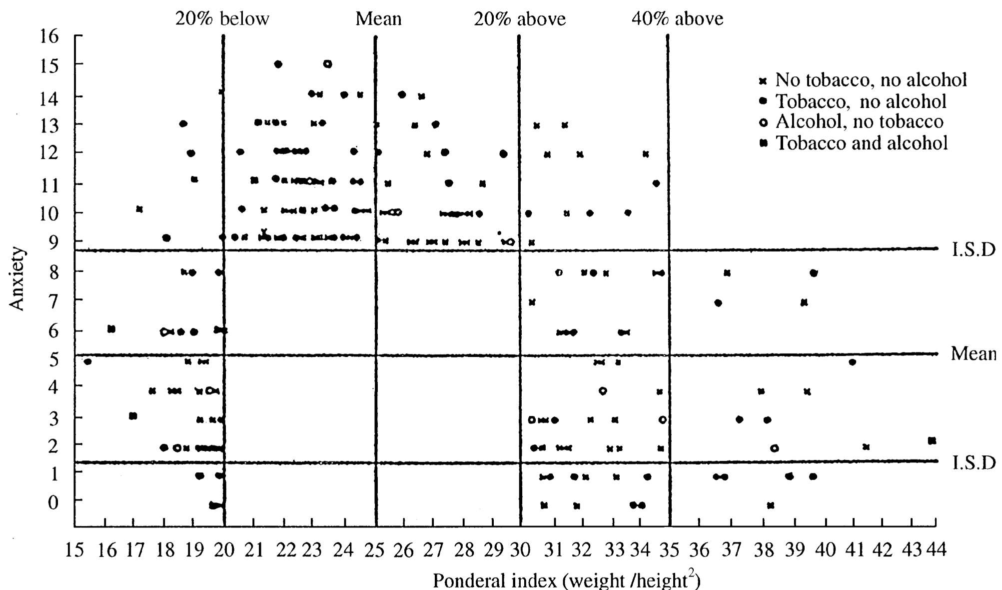

Figure 4. The relationship between "anxiety" and "fatness" (Ponderal index) in women aged 40 years and older. The dense central block of subjects is excluded for purposes of clarity. Reproduced by kind permission of the Editors, *Proceedings of the 15th European Conference on Psychosomatic Research.*

relationships between BMI and mood and smoking was no longer related to thinness, though it remained linked to higher levels of anxiety. The relationship of smoking to weight concerns was not examined in this population. The association of thinness with smoking in older women accords with such findings in the U.S.A. and referred to earlier.

Meanwhile, the detailed analyses of both the London and Ottawa schoolgirl studies referred to earlier in this paper have recently been published (Crisp *et al.*, 1998). The methodology involved direct measures of weight and height. Both populations completed two of the questionnaires, one concerning body-weight/shape, eating and aspects of growth and the other concerning smoking. The first one asked in detail about weight, weight history, attitudes to weight and shape, eating habits and dietary preferences as well as menstrual history. The second questionnaire addressed smoking and reasons for it. Smoking amongst schoolchildren can be difficult to assess. They may perceive it as a forbidden activity and be reluctant to reveal it. Major studies of smoking amongst school populations carried out by the Office of National Statistics (ONS) have tackled this by using direct questioning followed-up by a retrospective diary which invites subjects to record all cigarettes smoked during the preceding seven days (Office of Population Censuses and Surveys, 1988). In our study, the definition of a smoker was based on ONS-defined smoking categories. A smoker was someone who reported either occasional or regular smoking; a non-smoker reported never having smoked or else having given up after trying once or twice. The smokers amongst both populations also completed questionnaires in which they reported reasons for smoking and the effects they foresaw should they stop. The schoolgirls were also asked about alcohol consumption in the diary questionnaire.

In addition, aspects of mood were measured by questionnaires. The London population completed a questionnaire which addressed five major categories of anxiety, concerning weigh, food, social anxiety, agoraphobia and generalized anxiety (5–8 item scales for each category allowing scores of 1–4 on each item). They also completed a negative mood inventory (including self-report of sadness, hopelessness, low self-esteem and uselessness) designed to detect “depression”. The weight, food, social and generalized anxiety scales have all demonstrated good discriminatory capacity in respect of normal individuals and those with anorexia nervosa. The Ottawa schoolgirls received the Revised Childrens’ Manifest Anxiety Scale (RCMAS) questionnaire. This highly standardized 37-item self-report questionnaire provides scores on global anxiety and on three subscales (physiological anxiety, worry/oversensitivity, and social concerns/concentration) (Reynolds and Richmond, 1979; Wisniewski *et al.*, 1987).

Statistical analysis involved an initial univariate approach followed by multiple logistic regression.

Age and smoking

Reported smoking amongst the two populations varied with age (see Crisp *et al.*, 1998, Table 3) and was commonest amongst 15-year-olds. Ten to 14-year-olds in both populations smoked less whilst 16-year-olds in London also smoked less. A close relationship existed with (biological) menarchal age. When all other factors are taken into account, these schoolgirls are two to three times more likely to smoke if they are postmenarchal.

Body-weight, menstruation, ingestive patterns and smoking

In the main regression analysis the tendency for smoking to be associated with being “overweight” as distinct from “very overweight” or less than “overweight”, again revealed

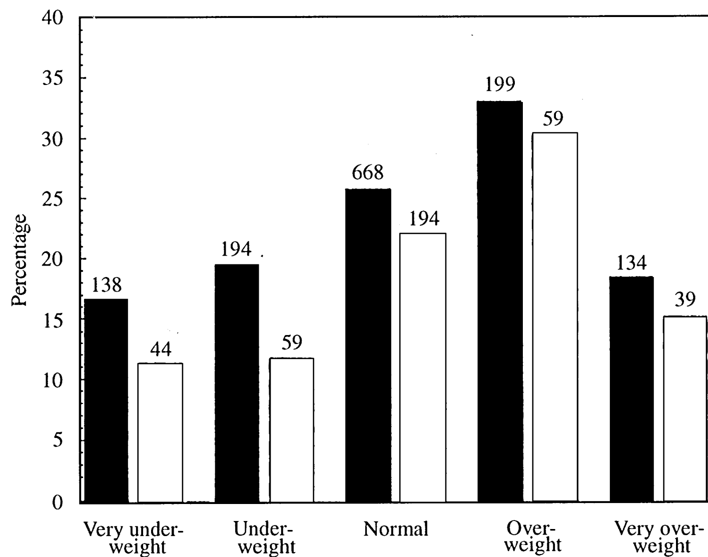

Figure 5. Relationship of percentile weight categories to smoking. (■) = London; (□) = Ottawa. Reproduced from *Postgraduate Medical Journal* 1998, **74**, 473–479, with permission from the BMJ Publishing Group.

itself. The data show the noticeable similarities between the London and Ottawa populations in this respect (Figure 5).

There was a significant association in the London schoolgirls, a tendency in the Ottawa schoolgirls and a significant association in the combined populations between smoking and reported postmenarchal weight loss at some stage since puberty equal to or greater than 7 kg. For instance, in London, such schoolgirls were 70% more likely to smoke. The Ottawa schoolgirl smokers, in whom the association with weight loss since puberty was less robust, also reported a 90% greater likelihood of smoking in association with major weight fluctuations during this same period.

A striking and highly significant reported association with cigarette smoking was that of alcohol consumption. Schoolgirls were seven times more likely to smoke if they also reported drinking alcohol.

A tendency in both populations for smoking to be associated with "proneness to overeating" was significant (30% more likely) when the two populations are combined.

The relatively high proportion of smokers also reporting frequent vomiting behaviour approached significance for each population in the original model, and was significant (80% more likely to smoke) in the reduced model for the combined population. Such vomiting was highly significantly associated with both recent and longer term weight-gain concerns, but not with alcohol consumption.

Anxieties and smoking

A preliminary univariate analysis (Figure 6) of smoking in the London population in relation to mood revealed significant associations with high levels of weight anxiety, food/eating anxiety, depression, and low levels of agoraphobia when compared with non-smokers. In

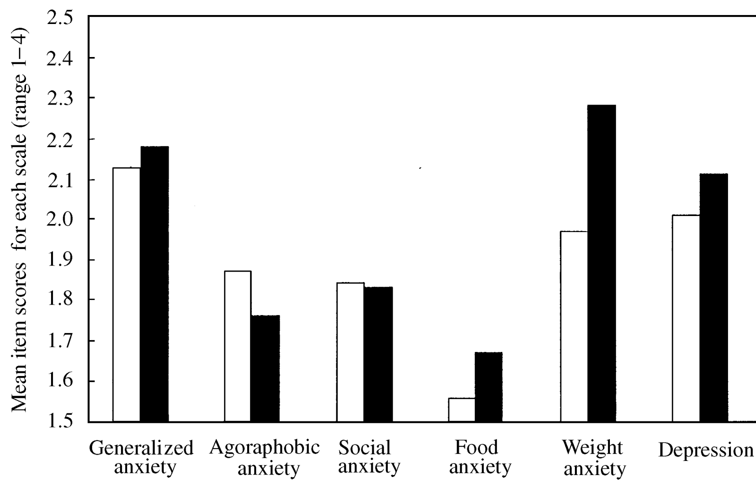

Figure 6. Smoking and mood scale scores expressed as mean item scores. (■) = Smokers ($n = 365$); (□) = non-smokers ($n = 1564$). Reproduced from Editor, *Postgraduate Medical Journal* 1998, **74**, 473–479, with permission from the BMJ Publishing Group.

Table 6 *Preferred weight as a percentage of actual weight. Regression coefficients derived from further logistic regression of this variable alongside those reaching significance in the combined populations*

Preferred/actual weight ratio	Regression co-efficient
≥ 95·0	(1)
90·0 ≤ <95·0	1·2 (0·9, 1·8)
85·0 ≤<90·0	1·1 (0·8, 1·6)
80·0≤ <85·0	1·8 (1·2, 2·7)
<80·0	0·9 (0·6, 1·5)

contrast, there were no differences with respect to generalized anxiety levels and social anxiety levels.

Within the first logistic regression analysis of the London population data (see Crisp *et al.*, 1998, Table 3) the surviving category of anxiety associated with smoking was a twofold one of high levels of "body-weight anxiety". The combined smoking populations significantly often reported worry about being "too fat." Meanwhile, the standardized RCMA measures of generalized and social anxiety used in the Ottawa population and also subject to logistical regression revealed no differences between smokers and non-smokers.

When the analysis was re-run including the variable "preferred weight as a percentage of actual weight" and categorized as shown in Table 6, then odds ratios only change slightly apart from the variable "worry about being 'too fat'". This loses its power in the face of the new variable. It can be seen that preferring to be between 15 and 20% "thinner"; is associated with nearly twice the likelihood of smoking. Other categories of preferred/actual weight were not significantly related to smoking.

Social class

It was not possible to examine smoking in relation to parental social class but the London schoolgirls have been studied in relation to their school status (state or private sector). In the younger age groups, there was a higher proportion of girls from state schools smoking. This was reversed after the age of 15 when girls from independent schools were more likely to be smokers. However, as the proportion of girls in the sixth forms of the state schools was considerably less than in the independent schools, it might be supposed that those remaining in the state schools after the age of 16 were an especially self-selected group. The state school group had a higher proportion of ex-smokers, whereas the independent schoolgirls, who started smoking at a later age, were less likely to give up smoking once they had started. Girls in London were significantly less likely to smoke within mixed sex schools.

Reported reasons for smoking and consequences of giving up

Similar to the eating disordered population studied earlier, the London and Ottawa smokers completed questionnaires on their reasons for smoking and the consequences they foresaw if they stopped (see Crisp *et al.*, 1998 for full lists). Personal reasons for smoking were more evident than social ones, but the schoolgirls ranked "Instead of eating" and "Makes you less hungry" lower than "Because I like it", "It relaxes you" or as "Something to do". Although they acknowledged positive health reasons for giving up, like the eating disordered population they foresaw eating more, putting on weight and getting bored as the most dreaded consequences.

Discussion

There is a significant literature concerning the relationship of cigarette smoking amongst females to their concerns about their shape (for which they take weight as a marker). This literature is largely ignored, possibly because its implications for intervention are too challenging. This paper reviews some of this literature and reports on several population studies undertaken over the last 30 years, the findings of which we claim lend support to this link and the unavoidable need to intervene at this level if one is to make substantial inroads into the problem.

Results from studies of the general population of teenage females suggest that the biologically low and unrealistic weights that many of them constantly seek create a commonplace state of dietary chaos, comprising cycles of highly successful attempts at rigorous dieting followed by reactive bingeing, which probably fuels ever increasing weight concerns. For instance, Lacey *et al.* (1978) found this to be a characteristic feature of schoolgirl eating behaviour over 20 years ago. Defensive tactics such as vomiting and smoking are likely to come into play as such dietary chaos and related weight concerns escalate.

In contrast to the high ranking assigned to weight and dietary concerns as an important basis for their smoking, normal schoolgirls, in common with the eating-disordered population, report much less often that smoking has arisen or is perpetuated for direct social or more intimate interpersonal reasons. Under these circumstances their frequent statements that they smoke because it "relaxes" them or because they are "bored" may relate mostly to the weight anxieties reported by nearly 50% of them and which, without smoking

as a defence, might threaten to overwhelm them. However, the more precise relationships of these feelings require further study.

The especially powerful association of smoking with vomiting in both eating-disordered and normal young females also requires further study. Though common enough in anorexia nervosa and an essential diagnostic feature of bulimia nervosa, vomiting as a tactic to avoid feared weight gain following a binge arises in less than 5% of normal schoolgirls. Nevertheless, when it occurs, the aftermath may include unpleasant visceral sensations that are especially disturbing if they include a renewed impulse to binge. Furthermore, this may be an expression of the greater impulsivity of which they are interoceptively unaware but which has become a reinforcing psychopathological factor. Incessant defensive smoking can then arise especially if an eating disorder is present and severe.

Interoceptive unawareness was higher in those eating disordered subjects who smoked, especially in relation to the admission that smoking was related to temptation to binge and used as an alternative to such feared behaviours. The most interoceptively unaware were also convinced that giving up smoking would not lead to better health, in contrast to the majority view of smokers in the population. This subpopulation, unable readily to distinguish emotions from visceral experience of hunger and satiety, might be expected to have the greatest investment in persisting with smoking as a defence against the impact of such poorly differentiated experience including emotions that, clinically, it is apparent they cannot manage or tolerate.

It is noteworthy that, whereas we and others have shown once again that amongst teenage females (aged 11–18 years) in the general population it is the moderately overweight who smoke most, amongst older women (aged 40+ years) smoking is associated with thinness. Moreover, in our general population study, for women aged less than 40 years body-weight was normal amongst smokers! One interpretation of this is that smoking "works" in enabling females to lose substantial amounts of weight and to control their weight over the decades of reproductive life. It is not an unrealistic course of action if perceptions of one's own weight and shape are so important as to dominate existence. Thus the majority of teenage females who smoke are well aware that it damages their health but continue to smoke. Even smoking within pregnancy can help curb the propensity that otherwise exists to eat more at such times. Thus, pregnancy can come to be perceived as a licence so to do and rebound excessive eating may become entrained despite its long-term consequences of a greater postpartum weight; that is unless immediate defences such as smoking can be marshalled. Moreover, eating less in pregnancy with the help of smoking can carry the often perceived reward of the prospect of a smaller baby at full term (possibly one of the mechanisms by which smoking in pregnancy comes to be associated with small babies!) and with a resultant less painful labour. Additionally, dietary irregularities and subsequent strains of motherhood may further destabilize the postnatal dietary pattern and probably intensify the need for a renewed and strengthened battery of defences including smoking in the attempt to re-entrain weight loss and weight control.

We suggest, as others have done before, that smoking amongst females has major determinants of the above kind which may underwrite the resistance to giving up that society now recognizes as a feature of young and middle-aged adult women. Preventive measures may need to address the underlying causes of these shape/weight concerns (Crisp *et al.*, 1988). These include recognition that they derive at least in part from the enduring developmental and existential challenges for the female, which she often experiences in

terms of her biologically based "fatness" and which may not be primarily attributable to anything as superficial and commercially reactive as "fashion".

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References

Action on Smoking and Health (1986). *Women and Smoking.* London: ASH.
Bjelke, E. (1971). Variation in height and weight in the Norwegian population. *British Journal of Preventive and Social Medicine*, **25**, 192–202.
Bosanquet, N. and Trigg, A. (1991). *A Smoke Free Europe in the Year 2000. Wishful thinking or realistic strategy?* Health Policy Unit Discussion Paper 4. Chichester: Carden Publications.
Calman, K. C. (1995). On the state of the public health. *Health Trends*, **27**, 1–5.
Crisp, A. H. (1967). The possible significance of some behaviour correlates of weight and carbohydrate intake. *Journal of Psychosomatic Research*, **11**, 117–131.
Crisp, A. H. (1980). Anorexia nervosa: *Let Me Be*. London: Academic Press (Reprinted, Hove: Lawrence Erlbaum Associates, 1995).
Crisp, A. H. (1985). Regulation of the self in adolescence with particular reference to anorexia nervosa. *Transactions of the Medical Society of London*, **100**, 67–74.
Crisp, A. H. (1986). Some psychopathological aspects of obesity. In *Proceedings of the 15th European Conference on Psychosomatic Research*, Lacey, J. K. and Sturgeon, D. E. (Eds). London: John Libby, pp. 120–128.
Crisp, A. H. and Priest, R. G. (1971). Psychoneurotic profiles in middle age. A study of persons aged 40–65 registered with a general practitioner. *British Journal of Psychiatry*, **119**, 385–392.
Crisp, A. H. and McGuiness, B. (1976). Jolly fat. The relation between obesity and psychoneurosis in the general population. *British Medical Journal*, **1**, 7–9.
Crisp, A. H., Halek, C., Sedgwick, P., Stavrakaki, C., Williams, E. and Kiossis, I. (1998). Smoking and pursuit of thinness in schoolgirls in London and Ottawa. *Postgraduate Medical Journal*, **74**, 473–479.
Crown, S. and Crisp, A. H. (1979). *Manual of the Crown-Crisp Experiential Index*. London: Hodder and Stoughton.
Fisher, M. and Gordon, T. (1985). The relation of drinking and smoking habits to diet: the Lipid Research Clinics Prevalence Study. *American Journal of Clinical Nutrition*, **41**, 623–630.
Foulds, J. and Godfrey, C. (1995). Counting the costs of children's smoking. *British Medical Journal*, **311**, 1152–1154.
Garner, D. and Olmsted, M. (1984). *Manual for Eating Disorder Inventory.* Odessa: Psychological Assessment Resources Inc.
Grube, J. W., McGree, S. and Morgan, M. (1986). Beliefs related to cigarette smoking amongst Irish college students. *International Journal of Addiction*, **21**, 701–706.
Halek, C., Kerry, S., Humphrey, H., Crisp, A. H. and Hughes, J. M. (1993). Relationships between smoking, weight and attitudes to weight in adolescent schoolgirls. *Postgraduate Medical Journal*, **69**, 100–106.
Huenemann, R. L., Shapiro, L. R., Hampton, M. C. and Mitchell, B. E. (1966). A longitudinal study of gross body composition and body conformation and their association with food and activity in a teenage population. *American Journal of Clinical Nutrition*, **18**, 325–338.

Humphrey, H., Joughin, N. A. and Crisp A. H. (1992). *Smoking amongst females with eating disorders (mainly anorexia nervosa) in the general population.* Paper presented at 5th International Conference on Eating Disorders, New York.

Jarry, J. L., Coambs, R. B., Polivy, J. and Herman, C. P. (1998). Weight gain after smoking cessation in women, the impact of dieting status. *International Journal of Eating Disorders*, **24**, 53–64.

Jourard, A. M. and Secord, P. F. (1955). Body-cathexis and the ideal female figure. *Journal of Abnormal Social Psychology*, **50**, 243–246.

Klesges, R. C. and Klesges, L. M. (1988). Cigarette smoking as a dieting strategy in a university population. *International Journal of Eating Disorders*, **7**, 413–419.

Klesges, R. C., Meyers, A. W., Klesges, L. M. and La Vasque, M. E. (1989). Smoking, body weight and their effects on smoking behaviour: a comprehensive review of the literature. *Psychological Bulletin*, **108**, 204–230.

Lacey, J. H., Chadbund, C., Crisp, A. H., Whitehead, J. and Stordy, J. (1978). Variation in energy intake of adolescent schoolgirls. *Journal of Human Nutrition*, **32**, 419–426.

Morgan, J. F. and Lacey, J. H. (1999). Smoking, eating disorders and weight control. *Postgraduate Medical Journal*, **75**, 127 (letter).

Murray, M., Swan, A. V. and Clarke, G. (1984). The long term effect of a school-based anti-smoking programme. *Journal of Epidemiological and Community Health*, **38**, 247–252.

National Cancer Institute of Canada (1991). *Annual Report, 1990–1991.* Toronto: National Cancer Institute of Canada.

Nylander, I. (1971). The feeling of being fat and dieting in a school population. *Acta Sociomedica Scandinavica*, **3**, 17–26.

Office of Population Censuses and Surveys (1988) *Smoking Amongst Secondary School Children.* London: Her Majesty's Stationary Office.

Reynolds, C. R. and Richmond, B. D. (1979). Factor structure and construct validity of "What I think and feel": the Revised Children's Manifest Anxiety Scale. *Journal of Personal Assessment*, **43**, 281–283.

Royal College of Physicians (1992). *Smoking and the Young.* London: Royal College of Physicians.

Townsend, J., Wilkes, H., Haines, A. and Jarvis, M. (1991). Adolescent smokers seen in general practice: health, lifestyle, physical measurements and response to smoking advice. *British Medical Journal*, **303**, 947–950.

Wack, J. T. and Rodin, J. (1982). Smoking and its effects on body weight and the system of caloric regulation. *American Journal of Clinical Nutrition*, **35**, 366–380.

Wechsler, H., Rigotti, N. A., Gledhill-Hoyt, J. and Lee, H. (1998). Increased levels of cigarette use among college students. *Journal of the American Medical Association*, **280**, 1673–1678.

Williamson, D. F., Madans, J., Anda, R. F., Kleinman, J. C., Giovino, G. A. and Byers, T. (1991). Smoking cessation and severity of weight gain in a national cohort. *New England Journal of Medicine*, **324**, 739–745.

Wiseman, C.V., Turco, R.M., Sunday, S.R. and Halmi, K.A. (1998). Smoking and body image concerns in adolescent girls. *International Journal of Eating Disorders*, **24**, 429–433.

Wisniewski, J. J., Genshaft, J. L., Multak, J. A. *et al.* (1987). Test retest reliability of the Revised Children's Manifest Anxiety Scale. *Journal of Perceptual Motor Skills*, **65**, 67–78.