

Attrition and Retention in Multidisciplinary Weight Management Interventions for Adults with Obesity: A Systematic Review

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Abstract

Background

High rates of attrition undermine the success of weight management interventions (WMIs), but a comprehensive understanding of the factors that increase dropout risk remains absent. This is partly explained by heterogeneity of intervention design, and the absence of a universal definition of attrition. This systematic review aimed to identify the factors related to- and predictive of attrition and retention in multidisciplinary WMIs for adults with obesity.

Methods

The systematic literature search, conducted in Cochrane, Medline, PsycInfo, and Scopus, aimed to identify original research articles published between February 2008 and December 2019. Articles investigating attrition or retention in multidisciplinary WMIs were eligible for inclusion if interventions were for adults (≥ 18) with obesity identified by body mass index $\geq 30\text{kg}/\text{M}^2$ and lasted ≥ 6 months. Multidisciplinary was defined as ≥ 2 interventionist disciplines or professions, for the purpose of this review. Data was synthesised narratively.

Results

The literature search resulted in seventeen studies which satisfied the inclusion criteria. Attrition rates ranged from 10% at 3-months to 81% at 3-years. The sociodemographic factors associated with reduced risk of attrition included older age, living in less deprived areas, higher levels of education, and female gender. Poor mental health, low social support, high weight loss goals and poor or unsatisfactory results may increase the likelihood of participant dropout, but evidence was limited and inconclusive because of different methodologies, and only a small number of studies investigating some of the variables.

Conclusions

The scope for targeted retention strategies is limited because few variables were consistently associated with attrition. Until a comprehensive understanding of attrition emerges, WMIs should seek to reduce social inequities in the benefit of WMI provision. Future research should consider factors reported qualitatively, such as intervention expectations and satisfaction, social support, patient-clinician relationships, and logistical barriers. Adopting a universal definition of attrition and de-homogenising participant dropouts would advance future research. As qualitative evidence is limited, exploring participant experiences of WMIs would help understand how attrition rates can be reduced, and in-turn improve WMI effectiveness.

Background

The success of weight management interventions (WMIs) is dependent on participant engagement, but outcomes are hindered by attrition rates, which range between 10 and 80% in published studies [1]. Hagen & Foreyt [2] referred to "the dropout problem in obesity research" in 1976, and a call to action to measure and report on attrition in obesity treatment programmes was published in 2014 [3]. Developing a better understanding of the factors that contribute to attrition would aid the effectiveness of WMIs because longer-term engagement improves outcomes [4, 5]. For adults with obesity, reductions of $\geq 5\%$ bodyweight can improve physiological and psychological health, and consequently reduce healthcare costs [6]. These clinical and economic benefits demonstrate the value of effective WMIs and underpin the need to retain participants to complete them.

In addition to compromising WMI effectiveness, attrition rates as low as 5-20% can reduce methodological quality of research and undermine valid and reliable conclusions [7]. Internal validity is reduced when there are non-random systematic differences between the characteristics of the participants who complete and those who drop out, known as 'attrition bias' [8]. Furthermore, attrition undermines external validity when the participants who drop out alters the sample characteristics so that it no longer represents the source population [9].

Within the literature a range of sociodemographic, personality, behavioural, and health differences between completers and dropouts have been reported in WMIs, but reliability is limited because few variables have been consistently associated with attrition [1]. This may be partly explained by the fact studies have mostly relied upon routinely collected baseline data [1]. Further limitation exists because of the absence of a standardised definition of attrition, highlighted in a narrative review [3] which outlined 27 different definitions of attrition employed by WMIs. Intervention methods also vary significantly, some are multi-component and consist of treatment phases [10, 11], whilst others are single-component [12], and can range between 12-weeks [12] and 3-years [4]. In addition, studies mostly employ a binary definition of dropout or completer, and Davis & Addis [13] suggest early attrition may be indicative of disagreement with treatment rationale, and late dropout may result from difficulty in adopting intervention techniques. Such nuances would remain undetected if all dropouts were considered an homogenous group.

To date, few qualitative investigations have been published, leading to a call for more studies to explore patients' experiences of WMIs [14]. One study undertook semi-structured phone interviews with 766 participants to understand their reasons for dropping out of obesity treatment programmes [15]. Practical difficulties such as travel distance, family and work problems, other health concerns along with treatment dissatisfaction were the main reasons for dropping out, in addition to poor patient-therapist relationships and interactions. Other participant reported reasons for dropout include; not ready to implement behaviour change, travel barriers [16] lack of motivation [17], health-related issues and psychological problems [16, 18]. Reasons for completion include; motivated by health issues, obesity concerns raised by medical staff, and one-to-one, tailored and confidential appointments [19]. Evidently, the factors that influence whether participants either dropout or complete WMIs extend beyond routine baseline data.

At present there is limited evidence of effective retention strategies in WMIs. One meta-analysis reported financial incentives, a multicomponent intervention, and the inclusion of self-monitoring technology successfully reduced attrition in WMIs [20]. A systematic review of 63 WMIs concluded it was difficult to compare attrition across interventions because of design variations, including exclusion criteria, intervention methods, definitions of attrition and length of follow-up [1]. To overcome these limitations, the current review focused on multidisciplinary (MD) non-surgical WMIs for adults with obesity (body mass index (BMI) $\geq 30\text{kg}/\text{M}^2$), designed to provide a minimum of 6-months treatment. This was decided because MD WMIs are best equipped to address the many aspects of obesity [21, 22], and 6-months is considered a realistic duration to achieve clinically significant weight loss [22]. The aim of this systematic review was to identify the factors related to- and predictive of attrition and retention in MD WMIs for adults with obesity.

Methods

The review method followed the Preferred Reporting in Systematic Reviews and Meta-analyses guidelines [23], and was registered with PROSPERO; study ID: CRD42018110067.

Literature search

The databases searched were; Cochrane, Medline, PsycInfo, and Scopus. In addition, a call was sent to members of the Association for the Study of Obesity – a UK organisation consisting of individuals working in the field of obesity, for any relevant articles, and titles in reference lists not identified in the literature search were also included. The search terms used were; attrition OR dropout OR drop out OR retention OR retain OR attendance OR adhere* AND diet OR weight management OR weight reduction OR weight control OR weight loss OR lifestyle OR multi-disciplinary service OR multi-disciplinary treatment OR obesity treatment.

Study collection and data synthesis

A first database search was conducted on February 19th and 20th 2018 to identify studies published since 2008, and a second was performed on January 27th 2020, to identify studies published between February 2018 and December 2019. Eligibility criteria are shown in Table 1. Multidisciplinary treatments typically include a team of professionals, however, the scarcity of publications from MD obesity services has been highlighted elsewhere [24], consequently for the purpose of this review, interventions which employed at least 2 different interventionists of different disciplines/professions were considered sufficient. Where it was unclear whether articles met the inclusion criteria, studies were discussed between authors, and corresponding authors were contacted when necessary.

Table 1
– eligibility criteria

Inclusion criteria	Exclusion criteria
Written in English	Digital or web-based interventions
Published in peer-reviewed journals between February 2008 – December 2019	Studies of weight loss interventions for surgical populations
Participants had to be ≥ 18 , with obesity identified by $\text{BMI} \geq 30$	Studies exploring the effectiveness of pharmacological treatments for weight loss
Interventions had to be multidisciplinary (≥ 2 interventionist disciplines), designed to provide treatment for at least 6-months	
Studies must have investigated attrition/retention quantitatively using inferential statistics or qualitatively	

Descriptive characteristics include baseline sample, study design, eligibility criteria, intervention methods, follow-up timeframe, attrition rate, definition of attrition/completion employed, and all statistical results. Due to the heterogeneity in study characteristics including design, intervention methods, definitions of- and timepoints at which attrition was measured, data was synthesised narratively. For this review, factors associated with attrition and retention were categorised according to seven thematic categories; sociodemographic, weight/shape factors, behavioural, physical health, psychological health, personality & character, practice & intervention characteristics, similar to previous reviews [1, 25].

Quality assessment.

Studies were assessed for methodological quality using the Checklist for Measuring Quality [26], which is recommended for assessments of randomised and non-randomised studies [27, 28, 29]. The question used to assess statistical power was amended to represent appropriate statistical analyses. Studies were judged on whether a multivariate regression analysis was performed, and to what extent the variation in the outcomes could be explained by the regression model. A sample of four studies were assessed by authors JE and EDB, and results were compared and discussed to identify any inconsistencies, which informed the assessment of the remaining studies.

Results

In total, 8482 studies were retrieved through database searches, and 19 through other sources. Following removal of duplicates, 5416 records were screened, resulting in 77 full texts assessed for inclusion, of which 17 were considered to have satisfied the inclusion criteria. An overview of all included studies is given

in Table 2. The complete data identification process is shown in figure 1.

Statistical analyses & qualitative follow-up

All studies performed inferential statistical analyses to identify differences between completers and dropouts, using either null hypothesis tests or univariate regression analyses. All but three studies [11, 30, 31] followed these analyses with varying forms of multivariate regression. One study reported the model prediction rate [32], but none reported the level of variation explained by the model (R^2 equivalent). In addition to quantitative analyses, some studies used qualitative methods to explore post-treatment reasons for dropout (summarised in Table 3). One study undertook telephone interviews [17], and another performed a focus group [33]. Three studies collected participant-reported reasons for dropout but did not state the methods employed [10, 34, 35].

Sociodemographic factors

Younger age was associated with attrition in seven studies [4, 11, 30, 34, 36, 37, 38]. This was shown in five studies which used multivariate analyses [4, 34, 36, 37, 38], but not in a male-only analysis in one [38]. Two of the studies only performed univariate analyses [11, 30], one of which was specific to non-cases and non-severe cases of anxiety and depression [11]. Nine studies reported no relationship with age and attrition [10, 17, 31, 32, 33, 35, 39, 40, 41]. Of the studies which reported a relationship between sex and attrition, all reported men were more likely to dropout [17, 33, 36]. Following multivariate analyses, the relationship remained in two [33, 36], and one reported no difference [17]. Ten studies reported no relationship between sex and attrition [4, 10, 30, 31, 32, 34, 38, 39, 40, 41].

One study showed completers were more likely to be born in the country providing the intervention but did not perform multivariate analyses [31]. Another reported black- were less likely to attend than white participants but only in univariate analyses [33]. A third study reported 2-year retention was higher in white participants but not at 6-months, and ethnicity did not predict retention following multivariate analyses [34]. One study showed English first language predicted 1-year- but not 3-year retention [32].

Three studies reported lower levels of education predicted attrition [10, 17, 31], but one only performed univariate analyses [31]. Three studies reported no relationship [33, 34, 39]. Two studies found a significant relationship between occupational status and attrition, but none supported their findings with multivariate analyses [31, 37]. Three studies reported no relationship [10, 17, 34].

In three studies the odds of WMI completion were higher in individuals from least deprived areas [4, 36, 38], one of which identified higher early retention (defined as attending >2 appointments) in participants from the least deprived areas [4]. One reported the relationship was not present in a female-only analysis [38], and another reported no difference in deprivation indices across longer-term retention (>12 months) [4]. There was no relationship with attrition when anxiety and depression was stratified by deprivation indices in one study [11].

Marital status was not related to attrition [10, 17, 33, 34]. One study reported odds of continued engagement were lower for those with children in the household, but family structure was not associated with attrition, and focus group participants reported family issues was the reason for dropout [33]. One study reported no relationship between the number of children in the household and attrition [17]. In another study, an unstated number of participants reported dropout was a result of personal or family reasons [35]. A study from the USA reported health insurance with a specific provider predicted 2-year retention, but 96% of participants had insurance with this provider, and 25 of 30 dropouts reported change in health-insurance was the reason for dropout [34].

Body weight factors

Two studies reported completers had a lower baseline BMI [17, 34], but only one showed this following multivariate analysis [34]. Two studies reported higher BMI predicted completion [36, 38], but the results were not repeated in a male-only analysis in one [38]. A fifth study showed BMI was a predictor of retention at 1-year [32] but did not report the direction of the relationship (whether higher or lower BMI predicted retention). Eight showed no relationship [4, 30, 31, 35, 37, 39, 40, 41].

Four of the six studies which considered the relationship between baseline weight and attrition found no relationship [30, 35, 39, 40], and two studies reported odds of dropout increased with higher baseline weight [17, 42]. Three studies found no relationship between waist circumference and attrition [30, 35, 40], and hip-circumference and waist-hip ratio was also unrelated in one [40]. A Croatian study reported a significant relationship between completion and lower baseline waist circumference in univariate but not multivariate analyses [17]. One study found participants with higher body fat percentage had lower odds of completion [40], and one reported no relationship [30].

Of weight-related history factors considered, one study reported completers had a history of greater weight cycling but did not support this with multivariate analyses [31]. According to one study, childhood obesity predicted retention at 1- and 3-years [32]. Two studies reported younger age at first diet attempt predicted dropout [35, 40], but in one of the studies this was only evident in participants who received cognitive behavioural therapy (CBT), and not controls (no CBT) [35]. Three studies showed no relationship between age at onset of obesity and attrition [17, 31, 41]. Lowest or highest adult weight was not associated with attrition in two studies [35, 40], and one showed the number of diet attempts in cases and controls (with or without CBT), was not related to attrition [35]. Two studies reported no relationship between parental obesity and attrition [17, 31].

Two studies considered weight loss goals, one showed no relationship [40], and one reported odds of dropout increased with 'acceptable' and 'disappointing', but not 'dream' or 'happy' weight loss goals [42]. Dropout was also associated with weight loss required to achieve weight loss goals in the latter. Of two studies investigating weight loss results, one found lower weight loss at 1-month predicted dropout [40], and the other found no significant relationship [31]. An unstated number of participants in one study reported unsatisfactory weight loss as a reason for dropout [35].

Impact of weight on quality of life (IWQOL)-lite scale was not associated with attrition [34], neither was weighing at least monthly [31]. Completion was associated with less body dissatisfaction [31], but a multivariate analysis was not performed to support this finding.

Behaviours – dietary & other

One study found completers reported lower baseline energy intakes in a univariate analysis [30], and one reported no relationship [33]. Macronutrient intake [30], fibre intake [30, 33], diet type (Mediterranean vs standard) [17], and fruit and vegetable intake [33] were not significantly related to attrition. Of the diet and eating behaviour questionnaires explored, one study showed dropouts scored higher on the three-factor eating questionnaire hunger scale, but they did not perform a multivariate analysis [30], and another reported higher scores on the eating assessment test (EAT-26) scale predicted attrition in a univariate- but not multivariate logistic regression [39]. Other factors unrelated to attrition included: three-factor eating questionnaire restraint and disinhibition scales [30], EAT-26 total score, food preoccupation and oral control subscales [39], eating disorder [31, 41], binge eating [31, 35, 37, 40] and night-eating [31, 37].

One study reported non-smoking predicted 3- but not 1-year retention [32], and two reported no relationship [17, 33]. Drinking alcohol was unrelated to attrition in one [33].

Physical health

A range of comorbidities were considered in relation to attrition. Of studies which considered cardiovascular diseases, one reported patients with hyperlipidaemia were more likely to attend >6 months in univariate- but not multivariate analyses [4]. One reported that having coronary artery disease predicted retention at 1- and 3-years [32], two showed no relationship between attrition and heart disease [4, 38], and one found no relationship with baseline cholesterol levels [30]. Dropouts had lower baseline diastolic blood pressure in one study, but only in univariate- and not multivariate analyses [40]. Hypertension predicted retention at 1- and 3-years in one study [32], and in another patients with hypertension were more likely to attend >6 months in univariate- but not multivariate analyses [4]. Attrition was not related to baseline blood pressure in two studies [30, 32], systolic blood pressure in one [40], and hypertension in another [38].

Of the studies that considered diabetes, HbA1C or blood glucose levels, three reported no relationship [30, 32, 38], and one reported patients with diabetes were more likely to attend >6 months in univariate- but not multivariate analyses [4].

Table 2
– Overview of included studies

Study	Sample	Study design & setting	Inclusion / exclusion criteria	Intervention	Follow up & attrition rate	Definition of attrition or completion	Factors associated with & predictors of attrition & retention	No significant relationship
[30]	N 426 F 277 M 149 Age 45.4±12.2 BMI 40.0±6.6 Netherlands	Evaluation of a commercial obesity treatment centre	Not clearly stated	Lifestyle modification including physical activity, psychological counselling based on CBT & nutrition advice. Delivery using a combination of group & individual sessions	At 18 months, 58%	No definition given	Univariate: Dropouts scored higher on the three-factor eating questionnaire hunger scale (p=0.011). Completers were older (p<0.001) & reported lower baseline energy intake (p=0.021)	Sex, weight, BMI, waist circumference, fat mass, blood pressure, macronutrient & fibre intakes, TFEC restraint & disinhibition, SF-36 PCS & MCS, cholesterol, plasma glucose, HbA1C
[39]	N 82 F 67 M 15 Age 46.9±11.7 BMI 39.4±6.9 Italy	Observational in a University Hospital Clinical Nutrition Unit	Excluded BMI<30 & >62, severe or chronic medical conditions, psychiatric disorders, substance abuse within 6 months &/or current use of psychotropic medication	Personalised hypocaloric diet with nutrition counselling every 4 weeks for 12 months. Follow-up appointments with a Physician & dietitian addressed weight monitoring & topics such as nutrition education	6 months, 56.1%	Attrition: participants who missed ≥2 consecutive appointments	Univariate: Predictors of attrition: alexithymia (OR 9.96 95%CI 1.52-36.1, p=0.003) irritable mood (OR 6.1 95%CI 1.21-29.5, p=0.02) DCPR>1 (OR 4.72 95%CI 1.72-14.5, p=0.004) higher SCL-90-R-GSI scores (OR 8.87 95%CI 0.11-0.53, p=0.002) & higher EAT-26-dieting scores (OR 3.73 95%CI 0.01-0.17, p=0.05). Multivariate: alexithymia predicted attrition (OR 6.88 95%CI 1.24-38.0, p=0.002)	Age, gender, education, BMI, weight (kg), medic comorbidities, DCF diagnoses: demoralisation, illness denial, MIN diagnoses: depressive disorders, anxiety disorders, EAT-26: total score, total score (≥20), food preoccupation, ora control
[36]	N 3250 F 2331 M 919 Age 49.8±13.5 BMI 42.0±7.1 Scotland, UK	Observational cross-sectional study in an NHS specialist weight management service	Age ≥18 with BMI≥30 with obesity-related co-morbidities or BMI≥30 alone	Phase 1: 16-week group lifestyle intervention. Phase 2: 3, 1-hour sessions delivered monthly. Phase 3: 12, 1-hour weight maintenance sessions monthly. Interventions can include dietitians, clinical psychologists & physiotherapists	Up to 19 months. At 16 weeks, 30.7%	Completion: Attend ≥4 of 9 sessions in phase 1	Multivariate: men less likely to complete (OR 0.89 95%CI 0.80-0.99, P=0.036), odds of completion increased with age, ≥25 (p<0.001), affluence (p<0.001), BMI (p<0.001). Odds of completion greater in practices with patient list size of 4000-8000 vs <4000 (OR 1.21 95%CI 1.06-1.39, p=0.006), & decreased in practices with a higher % from deprived areas; >40% vs <15% (OR 0.74 95%CI 0.63-0.87, p<0.001)	Training practice, patient list >8000, distance to the service, quality & outcome framework points, practice population with 15-40% of its patients from the most deprived areas, practice referral rate

Study	Sample	Study design & setting	Inclusion / exclusion criteria	Intervention	Follow up & attrition rate	Definition of attrition or completion	Factors associated with & predictors of attrition & retention	No significant relationship
[40]	N 98 F 62 M 36 Age 44.8±14.2 BMI 35.2±4.8 Italy	Retrospective observational study in an academic, clinical nutrition outpatient service	Adult, BMI≥30. Excluded pregnant women, individuals with major physical illnesses & psychiatric disorders	6-months dietary behavioural programme with individualised diet plans provided by a dietitian. Monthly follow-up appointments conducted by a physician specialised in clinical nutrition to address obstacles hindering weight loss & physical activity	At 1 month, 21.4%, at 6 months 57%	No definition given	Univariate: Dropout associated with younger age at first diet attempt (p=0.005), higher body fat % (p=0.015), lower diastolic blood pressure (p=0.022), & higher SCL-90 anger-hostility scale score (p=0.022). Completion associated with higher weight loss at 1-month (-3.1±2.1% vs -1.8±1.8%, p<0.01) & 6 months (-7.3±4.1% vs -1.7±2.4%, p<0.001). Multivariate: body fat % (OR 0.84 95%CI 0.72-0.98, p=0.030) & SCL-90 anger-hostility scores (OR4.61 95%CI 1.26-16.85, p=0.021), age at first dieting attempt (OR 0.89 95%CI 0.81-0.98, p=0.016) & lower early weight loss % (OR 0.57 95%CI 0.34-0.95, p=0.029) predicted dropout	Age, sex, weight, height, BMI, systol blood pressure, waist circumference, hip circumference, waist-hip ratio, highest adult weight, lowest adult weight, weight loss goal (in kg), weight loss goal (%), SCL: somatisation, obsessivity-compulsivity, interpersonal sensitivity, depression, anxiety phobic anxiety, paranoid ideation, psychoticism, GSI, BES, BDI
[41]	N 92 F 80 M 12 Age 41.8±12.7 BMI 38.5±6.3 Italy	Observational in a University Hospital	BMI ≥30 age ≥18-65, excluded individuals with cognitive impairment, with severe & unstable illness or pregnant	Individual sessions every 2 weeks targeting decreased caloric intake combined with behavioural counselling to improve lifestyle, delivered by a dietitian & diabetologists	6 months, 32.6%	Attrition: individuals lost to follow-up within 6 months of the first evaluation appointment	Univariate: Completers scored higher for harm-avoidance using TCI (p=0.03). Non-completion associated with presence of any Axis I disorder (p=0.003) & anxiety disorder (p=0.02). Multivariate: completion was predicted by high reward-dependence scores (B=-148; OR 0.863 95% CI 0.751-0.991, p=0.037) & absence of any mental disorder (B=-2.011; OR 0.134 95%CI 0.034-0.529, p=0.004)	BMI, age, sex, age onset of obesity, TCI: (novelty seeking, reward dependence, persistence, self-directedness, co-operativeness, self-transcendence, eating disorder, mood disorder, somatoform disorder, impulse-control disorder

Study	Sample	Study design & setting	Inclusion / exclusion criteria	Intervention	Follow up & attrition rate	Definition of attrition or completion	Factors associated with & predictors of attrition & retention	No significant relationship
[31]	N 247 F 173 M 75 Age 40.8±11.8 BMI 41.4±5.6 Sweden	Observational in a specialist obesity clinic at a University Hospital	Not stated	Phase 1: lectures on lifestyle behaviours. Phase 2: group treatment based on lifestyle changes. Some groups were assigned to a 5-week liquid calorie diet based on staff's clinical judgement. Intervention team included a doctor, nurses, dietitians & a physiotherapist	Follow up unclear (37-45 weeks based on timeframes given), 63%	No definition given	Univariate: Completers were associated with a higher level of education (university level) ($p<0.001$), being born in Sweden ($p=0.016$) & in occupation or studying ($p=0.025$). Completers were associated with a history of greater weight cycling ($p=0.001$), & less body dissatisfaction ($p=0.046$)	Age, sex, Initial BMI % weight loss after screening, % weight loss after 5 lecture onset before adulthood, weight at least monthly, high motivation for weight reduction, high motivation for habit change, mental distress, binge eating, eating disorder, night eating, weight loss of control
[37]	N 634 F 634 Age 48±10.6 BMI 37.8±6.6 Italy	Observational across 8 Italian Health Service accredited medical centres specialised in obesity treatment	Female with BMI≥30, age between ≥18-65 & not in active treatment at time of enrolment	Lifestyle modification programmes across 8 centres, based on CBT (individual or group), prescription of diet & exercise, medical input & pharmacotherapy	At 12 months, 32.3%	Attrition: losing contact with the centre	Univariate: Dropouts were younger ($p=0.001$), had a higher rate of active employment & lower rate of retired participants ($p<0.001$), scored higher for novelty-seeking ($p=0.038$) & lower for self-directedness ($p=0.041$). Univariate logistic regression: younger age predicted dropout (OR 0.96 95%CI 0.94-0.97, $p<0.0001$) as did higher TCI novelty-seeking scores (OR 1.007 95%CI 1.0-1.013, $P=0.038$) & lower self-directedness scores (OR 0.994 95%CI 0.988-1.0, $p=0.042$), but not after adjusting for confounders	BMI, binge eating scale score, night eating questionnaire score, TCI: (harm avoidance, persistence, reward dependence, cooperativeness, self-transcendence)

Study	Sample	Study design & setting	Inclusion / exclusion criteria	Intervention	Follow up & attrition rate	Definition of attrition or completion	Factors associated with & predictors of attrition & retention	No significant relationship
[42]	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above	<p>Univariate: Dropouts weighed more at baseline (p=0.022). Dropout associated with amount of weight loss needed to reach weight loss goals, dream (p=0.004) happy (p<0.001) acceptable (p<0.001) & disappointing (p<0.001).</p> <p>Multivariate: odds of dropout increased with higher baseline weight (kg) (OR 1.1 for 10kg 95%CI 1.01-1.21, p=0.023), & weight loss needed to reach targets; for every 1% increase in weight loss needed to achieve acceptable- (OR 1.05 95%CI 1.02-1.08, p<0.001) and disappointing (OR 1.07 95%CI 1.04-1.10, p<0.001) targets</p>	Dream- and happy weight loss goals
[17]	N 124 F 92 M 32 Age 47.5±12.4 BMI 41.6±7.3 Croatia	Randomised single-blinded design	BMI≥30 age≥18-69. Excluded newly diagnosed T2DM, CVD, hypertension, recent change in antihypertensive & oral antidiabetic therapy, use of insulin therapy & weight-control drugs alcohol abuse, pregnant or breastfeeding	Patients allocated to either a Mediterranean diet or standard hypocaloric diet. Group therapy during a 5-day intensive educational intervention, followed by 5, 2-hour follow up visits at 7 days, 1, 3, 6 & 12 months. Intervention team included dietitians, pharmacists, nurses, endocrinologist & physiotherapist	12 months, 32.3%	No definition given	<p>Univariate: Completion associated with female sex (p=0.04), lower baseline BMI (p=0.008), lower baseline weight (kg) (p=0.001), lower baseline waist circumference (p=0.005) & higher levels of education (university level) (p=0.04).</p> <p>Multivariate: Dropout predicted by higher baseline bodyweight (OR 0.974 95%CI 0.954-0.994, p=0.01), completion predicted by higher education level (OR 3.261 95%CI 1.223-8.695, p=0.018)</p>	Age, employment status, marital status, number of children, age at onset of obesity (before or after 20), parental obesity, metabolic syndrome, number of prescribed drug thyroid problems, depression, smoking, type of diet (mediterranea v standard)

Study	Sample	Study design & setting	Inclusion / exclusion criteria	Intervention	Follow up & attrition rate	Definition of attrition or completion	Factors associated with & predictors of attrition & retention	No significant relationship
[10]	N 229 F 170 M 59 Age 18-64 BMI 37.7±6.6 Canada	Observational in a community-based weight management initiative	BMI≥30	Phase 1: 12-week group programme with an exercise therapist, dietitian, & psychologist delivered CBT. Phase 2: 12 weeks of exercise sessions to help with maintenance. Participants asked to attend with a family member or friend with BMI≥30 for support	24 weeks, 20.1%	No definition given	Univariate: Non-completion associated with past negative experience as a barrier to exercise (p=0.036), lower level of education (no postsecondary education) (p=0.005), not having a 'social buddy support contract' signed (p=0.046) & moderate or severe depressed mood (p=0.029). Multivariate: independent risk factors for non-completion included lower level of education (OR 2.90, CI 1.20-7.03, p=0.018) & not having a signed social support contract (OR 2.91, 95% CI 1.01-8.34, p=0.047)	Age, sex, marital status, employer status, ≥1 comorbidities

Study	Sample	Study design & setting	Inclusion / exclusion criteria	Intervention	Follow up & attrition rate	Definition of attrition or completion	Factors associated with & predictors of attrition & retention	No significant relationship
[11]	N 1838 F 1340 M 498 Age 49.1±13.5 BMI 43.26 Scotland, UK	Prospective cohort in an NHS adult weight management service	Age ≥18, BMI≥30 with obesity-related co-morbidities or BMI≥35 alone	Phase 1: 16-week group lifestyle intervention. Phase 2: 3, 1-hour sessions delivered monthly. Phase 3: 12, 1-hour weight maintenance sessions monthly. Interventions can include dietitians, clinical psychologists & psychotherapists	12 months 57.7%	Completion: attended ≥4/9 sessions in phase 1, ≥2/3 in phase 2, ≥6/12 phase 3	Univariate: using HADS-A scale, fewer patients with anxiety completed at 6-months (p=0.001), fewer patients with severe anxiety completed at 3-months (p=0.008), at 6-months (p<0.001) & 12 months (p<0.001). Using HADS-D scale, fewer patients with depression completed at 6-months (p=0.011) & 12 months (p=0.024). Fewer patients with severe depression completed at 12-months (p=0.028). Following stratification by age & HADS scores, at 12-months attrition lower with increasing age in non-cases- (p=0.001) & non-severe cases of anxiety or depression (p=0.001)	Anxiety & completion at 3 & 12 months, depression & completion at 3 months, severe depression & completion at 3 & 12 months, anxiety stratified by sex, depression stratified by sex, deprivation stratified by anxiety deprivation stratified by depression

Study	Sample	Study design & setting	Inclusion / exclusion criteria	Intervention	Follow up & attrition rate	Definition of attrition or completion	Factors associated with & predictors of attrition & retention	No significant relationship
[38]	N 2156 F 1591 M 565 Age F 44.6 M 47.5 BMI ≥30+ Scotland, UK	Evaluation of an NHS weight management clinic	Age ≥18, BMI ≥30 with co-morbidities or BMI ≥35. Excluded pregnant women, being unable to attend outpatient clinic, in early stages of smoking cessation & current poorly controlled psychiatric illness	Phase 1: 16-week group lifestyle intervention. Phase 2: 3, 1-hour sessions delivered monthly. Phase 3: 12, 1-hour weight maintenance sessions monthly. Interventions can include dietitians, clinical psychologists & physiotherapists	Up to 19 months. Attrition assessed at end of phase 1 – 16 weeks, 62.5%	Completion: attending ≥4 or 9 sessions in phase 1	<p>Univariate: in entire cohort, completion associated with older age (≥40) (p<0.01), higher BMI (p=0.02), COPD (p=0.03) and living in less deprived areas (p=0.01)</p> <p>Multivariate: In entire cohort odds of completion increased with older age (≥40) (p<0.01), higher BMI (p=0.02) & living in less deprived areas (p<0.01). COPD associated with decreased odds of completion (OR 0.56 95%CI 0.37-0.86, P=0.01). In females, odds of completion increased with older age (p<0.01), higher BMI (p=0.05) & decreased with COPD (OR 0.53 95% CI 0.31-0.89, p=0.02) & stroke (OR 0.38 95% CI 0.19-0.76, p=0.01). Male patients from less deprived areas more likely to complete (p<0.01)</p>	<p>In entire cohort, see heart disease, hypertension, stroke, osteoarthritis, hypothyroidism, diabetes mellitus, anxiety, depression, prescribed drug use</p> <p>In male-only analysis: age, BMI, comorbidities, prescribed drug use</p> <p>In female-only analysis: heart disease, osteoarthritis, hypertension, hypothyroidism, diabetes mellitus, anxiety, depression, prescribed drug use, deprivation</p>

Study	Sample	Study design & setting	Inclusion / exclusion criteria	Intervention	Follow up & attrition rate	Definition of attrition or completion	Factors associated with & predictors of attrition & retention	No significant relationship
[34]	N 270 F 140 M 130 Age 49±8 BMI 41±5 USA	Observational in a University weight management programme	Not clearly stated	Initial intensive energy restriction for 3-6 months with aim of 15% weight loss, followed by behaviour change & physical activity counselling. Appointment with exercise physiologist to develop an activity programme. Entire 2-year programme involves 11 visits with a physician & 26 with a dietitian	At 3 months, 10%, at 6 months, 17%, at 12 months, 33%, at 18 months, 45%, at 2 years, 49% - excludes n30 participants who voluntary left	Short term completion: attending ≥1 visit at 6 months, 2-year completion: attending ≥1 visit at 2 years	Univariate: At 6 months, completers were older (p=0.0033), & had lower BMI's (p=0.0177). At 2 years completers were older (p=0.0002), white ethnic (p=0.049), had lower BMI's (p=0.0015), better quality of life (using IWQOL-lite) (p=0.0138) & less present with depressive symptoms (using IDS-SR) (p=0.0331). Multivariate: older age (OR 1.06 95% CI 1.02-1.09, p=0.0013), lower baseline BMI (OR 0.93 95% CI 0.87-0.99, p=0.0139) & having health insurance with a specific provider (96% of participants had insurance with this provider) (OR 5.92 95% CI 1.16-22.68, p=0.0337) predicted retention at 2 years	6-month or 2-year retention & sex, education, employment, marital status, distance to intervention site, comorbidities, EQ-5D: (mobility limitations, self-care limitations, usual activities problems: pain, anxiety/depression) 6-month retention ethnicity, education, employment status, IWQOL-lite, IDS-SR

Study	Sample	Study design & setting	Inclusion / exclusion criteria	Intervention	Follow up & attrition rate	Definition of attrition or completion	Factors associated with & predictors of attrition & retention	No significant relationship
[4]	N 2457 F 71.6% M 28.4% Age 48.6±13.8 BMI 45.6±6.8 England, UK	Evaluation of an NHS weight management service	BMI≥40 or BMI≥35 with ≥1 comorbidities	Personalised plan set by a GP lasting up to 2 years, with a dietitian, physiotherapist & occupational therapist, & referrals to local leisure centre classes. 12, weekly group sessions. Reviews every 1-3 months & weekly weight checks optional. Prescription of orlistat or liquid meal replacements available on a self-pay basis	Of patients who attended initial consultation (n1929): 19% did not attend one additional appointment, 35% did not attend ≥2 appointments & 61% dropped out <6 months	Attrition not clearly defined. Basic level of engagement was attendance at initial consultation & further ≥2 appointments. Longer-term engagement defined as attendance at >6 months	Univariate: Attenders >6 months were older (51.7±12.9 vs 47.8±13.9, p<0.001), & more likely to have diabetes (p=0.001), sleep apnoea (p<0.001), hypertension (p=0.009), hyperlipidaemia (p=0.01) & joint pain (p<0.001). Of those who engage in >2 appointments, a higher proportion were from the least deprived quintile (p=0.003), & of those who engaged >6 months, a higher proportion were also from the least deprived quintile (p=0.01). Multivariate: attendance >6 months was associated with increasing age (OR 1.017 95%CI 1.008-1.026, p<0.001), living in less deprived area (OR 1.082 95%CI 1.012-1.157, p=0.02) & presence of sleep apnoea (OR 1.357 95%CI 1.077-1.710, p=0.001)	Engagement >6 months: gender, BMI, depression, ischaemic heart disease, engagement >12 months: deprivation

Study	Sample	Study design & setting	Inclusion / exclusion criteria	Intervention	Follow up & attrition rate	Definition of attrition or completion	Factors associated with & predictors of attrition & retention	No significant relationship
[32]	N 1109 F 759 M 350 Age 48.3±13.1 BMI 45.3±9.3 Australia	Evaluation of a hospital-based weight control clinic	Adult with a BMI≥35 or ≥30 with a weight-related comorbidity & have made previous unsuccessful attempts to lose weight or maintain weight loss	Initial VLED phase with appointments every 2-4 weeks, followed by a transition period with dietary & lifestyle modification. Long-term weight maintenance phase with appointments every 1-3 months. Treatment staff include endocrinologists & dietitians. Pharmacotherapy used for patients unable to maintain weight loss	At 1-year, 58.0%, at 3-years, 80.8%	Completion: still attending at 3-years	Multivariate: 1-year retention (prediction rate 75.9%) predicted by childhood obesity (OR 1.38 95%CI 1.03-1.85, p<0.05) BMI (direction not stated) (OR 1.02 95%CI 1.0-1.03, p<0.05) English 1st language (OR 0.53 95%CI 0.28-0.99, p<0.05) hypertension (OR 1.69 95%CI 1.26-2.26, p<0.001) & CAD (OR 1.82 95%CI 1.13-2.98, p<0.05). 3-year retention (prediction rate 83.7%) predicted by childhood obesity (OR 1.42 95%CI 1.00-2.01, p<0.05), asthma (OR 1.45 95%CI 1.02-2.07, p<0.05) hypertension (OR 1.66 95%CI 1.13-2.45, p<0.01) CAD (OR 1.67 95%CI 1.0-2.77, p<0.05) & non-smoking (OR 0.53 95%CI 0.31-0.87, p<0.05)	Sex, age, BMI & 3-year retention, asthma & 1-year retention, smoking 1-year retention, baseline blood pressure, type 2 diabetes, mental illness, English as 1st language & 3-year retention

Study	Sample	Study design & setting	Inclusion / exclusion criteria	Intervention	Follow up & attrition rate	Definition of attrition or completion	Factors associated with & predictors of attrition & retention	No significant relationship
[35]	N 59 F 59 Age Cases 42.2±10.4 Controls 42.4±14.0 BMI Cases 36.1±4.4 Controls 35.6±5.1 Italy	Nested case-control in an academic obesity outpatient unit	BMI≥30 age ≥18 & treatment resistant (≥2 previous diet attempts). Excluded pregnant women, major physical illness & history of psychiatric disorders & treatment	Cases received CBT by a psychologist & dietitian, including nutrition education, self-monitoring, physical activity, cognitive restructuring, behaviour chaining, behavioural strategies & relapse prevention. Controls received standard dietary treatment planned by a dietitian & supervised by a physician	6 months, 35% of cases & 62% of controls dropped out. 47% combined dropout rate	Failing to complete the 6-month program, but no definition of completion provided	Multivariate: Following age- and multivariate adjusted analyses, cases (received CBT) were more likely to complete than controls (OR 2.94, 95% CI 1.05-8.97) (OR 2.77, 95% CI 1.02-8.34) respectively. Age at first dieting attempt was an independent predictor of attrition in cases (beta -9.02, t= 5.40, p<0.05). Anger-hostility subscale was an independent predictor of attrition in controls (using SCL-90), (beta 7.86, t=5.40, p<0.05)	Age, weight, height, BMI, body fat%, waist circumference, highest or lowest adult weight, age at first diet attempt in controls, number of dieting attempts, SCL-90 scores: (somatization, obsessivity-compulsivity, interpersonal sensitivity, depression, anxiety-anger-hostility in cases, phobic anxiety, paranoid ideation), global severity index scores, BES scores, BDI scores
[33]	N 461 F 385 M 76 Age 18-55 BMI ≥30 USA	Prospective cohort set in a community weight management clinic	BMI≥30 age≥18-55	Bi-weekly group educational sessions on diet & physical activity with a health educator. Individual sessions with a lifestyle counsellor every 3-months, targeting weight-related behaviours	71% - timepoint measured not stated	Attrition: participants who do not return following first appointment	Univariate: Retention associated with female sex (p=0.053). Participants with children (p=0.036) & black ethnicity (p=0.006) associated with dropout. Multivariate: Women more likely to continue engaging (OR 2.33 95%CI 1.21-4.49, p=0.012). Having children reduced odds of retention (OR 0.60 95%CI 0.38-0.94, p=0.027).	Age, stages of change, physical activity, calorie- fru & vegetable- or fat intake, education, employment, marital status, family structure, smoking drinking, medication, comorbidities

Table 3
 – participant-reported reasons for dropout and findings from qualitative investigations (reported as was in original studies)

Study	Method	Reasons for dropping out / barriers to engagement
[17]	Telephone interviews	Lack of motivation &/or unwillingness to continue with follow-up n19/40 Health related issues & psychological problems n10/40 Unknown – unable to contact n8/40 Dissatisfaction with programme n3/40
[10]	Not stated	Personal reasons n31/46 Medical reasons (non-obesity related surgery) n15/46
[34]	Not stated	Changes in health insurance n25/30 Moving area n3/30 Pregnancy n1/30 Death n1/30
[35]	Not stated	Inadequate motivation Personal or family reasons Lack of achievement of a satisfactory Weight loss n per reason not stated
[33]	Focus group	Physical limitations or health issues Family issues Stress Lack of social support

Thyroid issues (hypothyroidism and thyroid problems) was not associated with attrition [17, 38]. In one study, female patients with chronic obstructive pulmonary disease and stroke were less likely to complete [38]. One study reported patients with sleep apnoea were more likely to attend >6 months [4], and another showed presence of asthma predicted 3- but not 1-year retention [32]. Attrition was not related to osteoarthritis [38], and baseline comorbidities in four studies [10, 33, 34, 39].

In one study, patients with joint pain were more likely to attend >6 months in a univariate- but not multivariate analyses [4]. One study identified no relationship between attrition and health-related quality of life metrics using Euro quality of life 5 dimensions (EQ-5D) mobility, including self-care, usual activity or pain problems [34]. In one study a small number of participants said health-related issues caused dropout [17], and medical reasons (non-obesity related surgery) were reported by 15 of 46 dropouts in the 'Healthy Weights Initiative' [10]. In another study, an unstated number of participants said physical limitations or health issues were the reasons for dropout [33]. Three studies reported no relationship between medication use and attrition [17, 33, 38].

Psychological health

Of six studies that considered the relationship between anxiety and attrition, one reported fewer patients with anxiety completed at 6-months, and fewer patients with severe anxiety completed at 3- 6- and 12-months, but they did not perform a multivariate analysis [11]. They also reported no relationship between completion and anxiety when stratified by gender. Five studies reported no relationship [34, 35, 38, 39, 41].

Of studies that considered depression or depressive symptoms, one reported non-completion was associated with moderate or severe depressed mood, but not after a multivariate analysis [10]. One study reported fewer patients with depression completed at 6- and 12-months, and fewer patients with severe depression completed at 12-months, but a multivariate analysis was not performed to support the findings [11]. The same study reported no relationship between depression and 3-month completion, and severe depression and 3- and 6-month completion. One study reported completion at 2-years was associated with less depressive symptoms using the inventory of depressive symptomology-short revised (IDS-SR) in univariate- but not multivariate analyses [34]. They also reported no relationship between depression and 6-month and 2-year retention, or between inventory of depressive symptomology & 6-month attrition. Six studies reported no relationship between depression and attrition [4, 17, 35, 38, 39, 40].

One study reported non-completion was associated with greater psychiatric disturbances (using symptom checklist revised, global severity index (SCL-90-R-GSI), irritable mood, type A behaviour (using diagnostic criteria for psychosomatic research (DCPR) framework) and having >1 DCPR diagnoses, but not following multivariate analysis [39]. They also reported no relationship between attrition and demoralisation or illness denial (DCPR diagnoses). One study reported dropout was associated with presence of any Axis I disorder, but not following multivariate analysis, but retention was predicted by absence of any mental disorder [41]. They also reported no relationship between attrition and mood disorder, somatoform disorder or impulse-control disorder. Neither mental distress [31] or mental illness were related to attrition [32]. An unstated number of participants said stress caused dropout in one study [33].

Personality/character

Of studies that investigated the temperament and character inventory (TCI) scale and attrition, one reported completion was associated with higher harm avoidance and reward-dependence, but only the latter was significant after multivariate analysis [41]. Novelty seeking, reward dependence, persistence, self-directedness, co-operativeness, self-transcendence was not associated with attrition. Another study reported that dropouts scored higher for novelty-seeking and lower for self-directedness in univariate- but not multivariate analyses, and harm avoidance, persistence, reward-dependence, co-operativeness and self-transcendence were unrelated to attrition [37].

Higher scores on the anger-hostility subscale of the SCL-90 predicted dropout in two studies [35, 40], the latter was specific to controls (participants who did not receive CBT). Both reported no relationship between attrition and other SCL-90 subscales [35, 40].

The only study to consider alexithymia reported it predicted dropout [39]. Retention at 2-years was associated with better quality of life using the IWQOL-lite questionnaire in one study, but not following multivariate analysis [34]. One study reported no relationship between attrition and quality of life measured with SF-36, physical component summary and mental component summary scales [30]. Others showed no relationship between attrition and weight locus of control [31], or stage of change [33].

The sole study to investigate attrition and motivation for weight loss and to change habits reported no significant relationship [31], but lack of motivation was reported as a reason for dropout by participants in two studies [17, 35]. Participants without a signed 'buddy social support contract' were less likely to complete in one study [10], and an unstated number of participants said lack of social support was a reason for dropout in another [33].

Practice or intervention characteristics

In one study, odds of completion were greater in practices with a patient list size of 4000-8000 compared to <4000, but lower in practices with a higher percentage of their population from deprived areas (>40% vs <15%) [36]. Being a training practice, patient list size >8000, practice rating (quality and outcome framework points), practice population with 15-40% of its patients from the most deprived areas, and practice referral rate were not related to attrition [36]. Travel distance was not related to attrition in two studies [34, 36]. Three of thirty participants reported that moving area was the reason for dropping out in one study [34]. One study reported that cases (receiving CBT) were more likely to complete [33], and a small number of participants said treatment dissatisfaction caused dropout in another study [17].

Quality assessment

Studies were mostly of moderate quality, as overall quality scores ranged between 13 and 20 (median 18) of a maximum score of 32. This was mostly due to the observational designs employed, which particularly limited the scores for internal validity and confounding. The median score and range for each section was; 7/11 (5-9) for reporting, 2/3 (1-3) for external validity, 4/7 (3-5) for internal validity, 4/6 (2-4) for confounding, and 1/5 (0-1) for power. No study reported the R² equivalent for the regression models, limiting scores for power.

Discussion

The aim of this systematic review was to identify the factors associated with- and predictive of attrition and retention in MD weight management interventions for adults with obesity.

Participant sociodemographic characteristics were the most consistently explored variables in the studies included in this review. Older age was often associated with reduced risk of dropout, which may be explained by differences in weight loss motives and preferences for WMI content between younger and older adults. Previous research shows older adults are more likely to cite health concerns as their motive for weight loss, and their efforts are more likely to be triggered by medical reasons [43]. Qualitative insight also suggests weight loss efforts are often motivated by concern from family members, and major family events such as the birth of children and grandchildren [44]. Participants also reported health-driven motives stem from the desire to avoid ill-health or ameliorate existing ill-health, as opposed to the acquisition of better long-term health, which may be more pertinent in older age.

There was some evidence that men were more likely to dropout, however most studies reported no difference between sexes. It has been shown that women utilise primary care services more than their male counterparts [45], and increased interactions with healthcare services may partly explain why women are sometimes more likely to continue engaging than men. A series of systematic reviews of male obesity management concluded that tailoring WMIs can benefit men, for example, men prefer WMIs set in the community include physical activity and nutrition [46]. They also like to focus on health as opposed to appearance and want regular contact with a high degree of personalisation, as well as setting goals, and incorporating humour and camaraderie.

This review identified evidence that participants from deprived areas were more likely to dropout, in addition to participants with lower levels of education. Previous research has shown individuals from deprived areas are less likely to participate in some health services [47, 48] and more likely to miss appointments [49], but the reasons why are not well understood. Participants of WMIs who are more socioeconomically deprived may face financial constraints which could undermine autonomy, requiring them to make compromises which their more affluent counterparts do not, compounding weight management challenges [50]. Furthermore, a review of socioeconomic inequalities of health care in England showed that, although people from deprived areas typically utilise healthcare services more than their richer counterparts, socially advantaged people are more likely to use preventive healthcare services and seek medical support at earlier stages of illness [51]. Such differences in the way healthcare services are used may help explain the relationship between attrition and deprivation. Ethnicity-related factors were scarcely investigated, and variables were different across studies, limiting the identification of trends related to attrition.

Some evidence suggests baseline weight measures were related to attrition, but the direction of the relationship was inconsistent, and the majority of studies reported no relationship. There was some quantitative and qualitative evidence that weight loss goals and results were related to attrition, but this was limited due to the small number of studies which investigated it. Similarly, a narrative review reported high weight loss expectations had often been associated with increased risk of dropout, but not in all studies [52]. This could be due to whether or not WMI expectations are addressed within the intervention, or qualitative differences in the reasons why participants engage in WMIs, which is not exclusively driven by weight loss. Some participants may focus on improving health, gaining support or developing new habits [53], which may offset unsatisfactory weight loss.

There were no trends evident between differences in dietary intakes or behaviours and attrition. There was limited evidence that smoking was related to attrition, and no evidence that alcohol intake affected participation, however these were scarcely explored.

There were some significant relationships between obesity-related comorbidities and attrition, but there was a limited number of studies which considered the same comorbidities. The majority of studies which investigated anxiety or depression (including depressive symptoms), reported no relationship with attrition, however, a large UK-based NHS service did report that presence of anxiety and severe anxiety, and depression and severe depression was related with short- and longer-term attrition. Poorer mental health has been associated with attrition in previous research [1], and inconsistent results may be partly explained by the different questionnaires used to assess mental health.

A number of psychometric scales were employed to explore aspects of personality and character and their relationship with attrition, but there was no consistent evidence of any relationship. However, only a small number of studies considered such factors, and they were smaller scale studies, limiting the available evidence. Significant relationships were reported between presence of alexithymia, a personality construct characterised by a deficit in emotional processing, i.e. an inability to explain and differentiate between emotions [54].

There was no evidence that travel distance significantly contributed to attrition, but only two studies considered this. In contrast, a qualitative study previously reported travel distance was a reason for dropout by one-fifth of 766 participants [15], demonstrating logistical barriers such as travel may vary depending on the geographical area.

Strengths of this review

There was a need to review studies investigating attrition in similarly designed WMIs, which this review has fulfilled by only including WMI studies which were MD and designed to treat adult obesity for a minimum of 6 months. This evidence gap was present because previous reviews had not restricted their inclusion criteria to similarly designed WMIs, and the broad range of interventions limited the extent to which results could be compared [1]. This review aids the understanding of attrition specific to longer-term MD WMIs for the treatment of adult obesity. This review is relevant because only studies published within the previous 12 years were eligible for inclusion, purposely set to identify WMIs with methods which were reflective of current weight management practice.

Limitations

Most of the evidence comes from observational research, and the absence of control groups means inferences are difficult to make, however, value is gained from exploring attrition in 'real world' services. There is a lack of publications from longer-term MD WMIs reporting on attrition, demonstrated by the fact few studies satisfied the inclusion criteria, which reflects the limitations of a previous systematic review of MD WMIs [24].

Further limitation stems from the different definitions of attrition or completion employed across studies. Definitions were based on either losing contact, loss to follow-up, non-attendance or level of attendance, and some failed to clearly define attrition. This is a key limitation because even amongst comparable WMIs, it cannot be known whether contentious results stem from inconsistent definitions or valid differences between studies. In addition, this review was limited by the fact that despite a large number of variables having been studied, variables such as treatment expectations, treatment results, logistics and measures of personality and character were only explored in a small number of studies, which were mostly smaller scale studies, limiting the sum of evidence available to draw conclusions.

Recommendations

Weight management services should focus on reducing social inequities in the benefit of WMI provision, as a comprehensive understanding of attrition remains elusive and current evidence suggests sociodemographic factors are the most likely to influence dropout.

In line with the 'Star Lite' core outcome measures, WMIs should report on attendance and completion rates, the number of participants who drop out and reasons why [55]. The Consolidated Standards of Reporting Trials statement also advise this [56]. Future publications should clearly define attrition and/or completion, and the need for a universal definition of attrition remains. This could be defined in accordance with the core outcome measures, which includes the measurement of; attendance at core sessions, completion (attend >80% of core sessions), and dropout/non-completion (participants who attend <80%). Studies may also benefit from de-homogenising dropouts into early (first 1/3 of treatment) and late (final 2/3 of treatment), as recommended elsewhere [3]. This would aid comparisons across studies and help develop a more comprehensive and nuanced understanding of attrition.

Studies should explore variables including participant expectations and satisfaction, the patient-clinician relationship, social support, and logistical barriers, which are reported in qualitative research [15], but scarcely explored in the studies in this and a previous review [1]. Qualitative research into attrition is needed, and we support a previous call for studies to explore participant experiences to help improve the design and acceptability of WMIs, and ultimately their effectiveness [14]. Ubiquitous technologies (e.g. short-messaging service), by minimising participant burden and financial cost, can facilitate large-scale qualitative data collection in WMIs [57], which could be utilised in future research.

Conclusion

The studies reviewed suggest older age, living in less deprived areas, higher levels of education and female gender were the sociodemographic factors with evidence of reduced risk of attrition. There was some, but limited evidence that poor mental health, low social support, high weight loss goals and poor or unsatisfactory results may increase the likelihood of dropout. Until a comprehensive understanding of attrition is developed, WMI should focus on reducing social inequities in the benefit of WMI provision. Future research should investigate participant expectations and satisfaction, patient-clinician relationships, social support, and logistical barriers, which are reported qualitatively but scarcely investigated quantitatively. Studies should ensure attrition/retention is clearly defined, and a universally recognised definition would aid comparisons. This could be defined as attendance or non-attendance at 80% of the core sessions of a WMI. Additional value may be gained from de-homogenising dropouts in WMIs. Qualitative research into attrition is needed, as participant experiences of WMIs could offer valuable insight to improve the effectiveness of WMIs.

List Of Abbreviations

BMI
Body mass index
CBT
Cognitive behavioural therapy
DCPR
Diagnostic criteria for psychosomatic research
EAT-26
Eating attitude test-26
EQ-5D
Euro quality of life 5 dimensions
IDS-SR
inventory of depressive symptomology-short revised
IWQOL-lite
Impact of weight on quality of life-lite
MD
Multidisciplinary
SCL-90
Symptom checklist
SCL-90-R-GSI
Symptom checklist revised, global severity index
SF-36
Short-form health survey
TCI
Temperament character inventory
WMI
Weight management intervention

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JE developed the protocol, conducted the literature search, data extraction, critical appraisal, and data synthesis, and wrote the draft and final version of the manuscript.

DH assisted assessment of whether studies satisfied the inclusion criteria and commented on drafts of the article.

EB-D assisted the development of the protocol, literature search, assessment of whether studies satisfied the inclusion criteria, critical appraisal, and commented on drafts of the article.

AS assisted the development of the protocol, literature search and assessment of whether studies satisfied the inclusion criteria and commented on drafts of the article.

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Figures

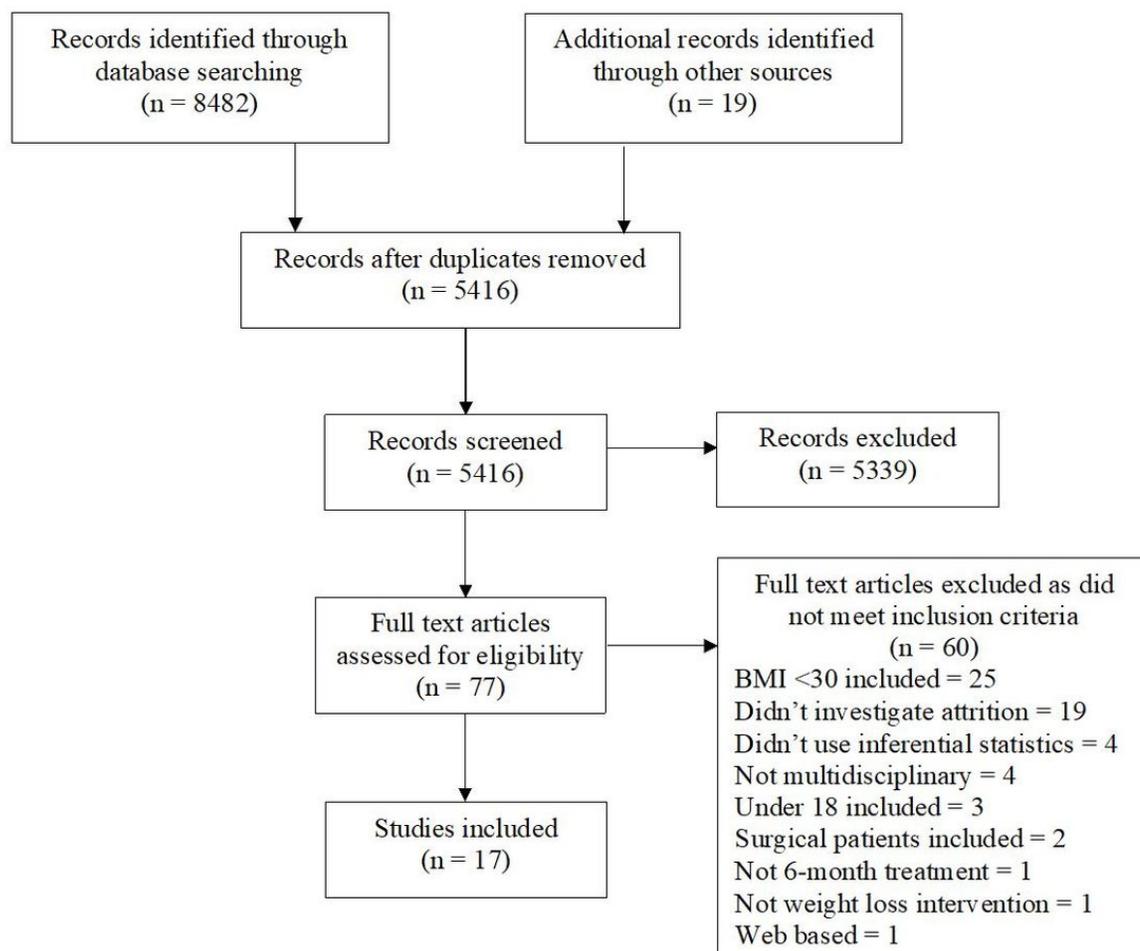


Figure 1

flow diagram of the data collection process