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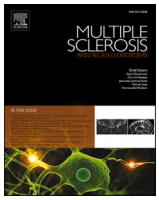

Review article

The association between body image and psychological outcomes in multiple sclerosis. A systematic review☆

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ABSTRACT

Background: Multiple sclerosis (MS) is a demyelinating autoimmune condition, in which body image may be altered due to a range of biopsychosocial factors. The aim of this review was to examine whether there is a relationship between body image and psychological outcomes in MS, in order to guide clinical intervention development.

Methods: PsycINFO, Medline, CINAHL and Scopus databases were searched systematically in November 2023 for eligible studies, using terms relating to MS and body image. Quantitative studies, published in English, that examined the relationship between body image and psychological outcomes in adults with MS were included. The QualSyst tool was used to assess risk of bias across studies. Screening and quality appraisal was verified by the third author. A narrative synthesis was used to report patterns in findings.

Results: Thirteen studies (ten cross-sectional and three intervention studies) met inclusion criteria and were included in the final review. The sample size across all included studies totalled 1533. The results suggested that positive body image was associated with improved mood, lower anxiety, increased self-esteem, and better quality of life. However, the causal nature of these relationships was unclear.

Conclusion: The findings offer preliminary evidence to suggest that a more negative body image is associated with higher levels of psychological distress in MS, indicating that body image may be a target for intervention. Further research is necessary to provide a greater understanding of this association, and to inform future clinical practice.

Introduction

Multiple sclerosis (MS) is a chronic demyelinating autoimmune condition affecting the central nervous system (Bobholz and Gremley, 2011; Gunnersen et al., 2022). MS is associated with a number of symptoms including sensory disturbances, mobility difficulties, visual problems, vertigo, sexual dysfunction, and cognitive difficulties (Ghasemi et al., 2017). The condition is associated with high levels of psychological distress, with a recent meta-analysis estimating prevalence rates of 31 % and 22 % for depression and anxiety, respectively (Boeschoten et al., 2017).

A number of psychosocial factors have been reported to be associated with higher levels of psychological distress in MS, including younger age, shorter disease duration, symptom severity, and sexual dysfunction (Hanna and Strober, 2020; Romano et al., 2023; Zavoreo et al., 2016). Quality of life (QoL) has been reported to be reduced in people with MS (Kołtuniuk et al., 2023). A large-scale systematic review (Gil-González et al., 2020) identified level of disability, unemployment, fatigue, psychological wellbeing, and cognitive decline as factors associated with lower QoL in MS.

Body image may be an important factor to consider when understanding the psychological experiences of people with MS. While there is no commonly accepted definition for the term 'body image' (Badoud and Tsakiris, 2017), it has frequently been described in the general population as a multifaceted construct, encompassing how individuals subjectively perceive and appraise their own bodies (Cash, 2004). The internal representation of a person's external appearance is important in developing a sense of self-awareness and personal identity (Przezdziecki et al., 2012; Tsakiris, 2010). Dissatisfaction in one's own body image can lead to the development of psychological difficulties such as anxiety and depression, as well as sexual dysfunction (Di Cara et al., 2019).

The term 'body image' is often used interchangeably within literature to describe another distinct concept, interoceptive awareness, which focuses on an individual's awareness and appraisal of internal bodily sensations or experiences (Mehling et al., 2012; Todd et al., 2019). Interoceptive awareness is a distinct dimension within the

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concept of interoception, which also includes interoceptive accuracy and interceptive sensitivity, referring to a person's ability to detect and perceive bodily sensations (Garfinkel et al., 2016). This review will focus only on interoceptive awareness, and the term interoception will be used to refer to this dimension only. From a psychological perspective, an individual's sensitivity to bodily signals closely links with their experiences and regulation of emotions (Badoud and Tsakiris, 2017). The extent to which interoceptive awareness contributes to body image is not fully understood, however there are indications that body image and interoception are related. There is evidence to suggest a neural connection between body image and interoception, with the insula being reported as a specific region involved in the cortical representation of both interoceptive and body image signals (Badoud and Tsakiris, 2017). Furthermore, it has been suggested that lower levels of interoceptive awareness may predispose individuals to greater body image dissatisfaction (Badoud and Tsakiris, 2017). Individuals with MS experience multisensory integration which can compromise both body image and interoception (Di Cara, 2019). A recent study demonstrated that individuals with MS exhibited lower interoceptive accuracy compared with healthy controls (Raimo et al., 2024). This review will include both interpretations of body image but will use the term "body image" to describe the former and "interoception" to describe the latter.

The aim of this systematic review was to examine whether there is a relationship between body image and interoception and psychological outcomes in MS. For the purpose of this review, psychological outcomes will be treated broadly, including but not limited to concepts such as anxiety, depression, QoL and self-esteem. A greater understanding of the relationship between body image and psychological outcomes in MS could allow clinicians to design psychological interventions appropriately, in order to provide person-centred support for people living with this condition.

Materials and methods

The current review was registered on PROSPERO, registration number CRD42023477640.

Selection criteria

Papers were considered suitable if they met the following inclusion criteria:

- Adult participants aged 18 and above, with a diagnosis of MS.
- Peer-reviewed, quantitative empirical papers, written in English.
- Included a measure of both body image or interoception and at least one psychological outcome. For the purpose of this review, the term 'body image' includes studies assessing individuals' perception or appraisal of external or internal aspects of their bodies. Studies using an external objective measure of body functioning were not included within the scope of this review, for example body mass index.
- The relationship between body image and psychological outcomes was examined in some way, for example using correlation or regression studies. Intervention studies that measured both body image and psychological outcomes pre and post intervention were included, however a relationship statistic could not be reported for such studies.

Search strategy

Studies were identified by searching across four databases: PsycINFO, Medline, CINAHL, and Scopus. These databases were selected to capture journals within the fields of psychology, neurology, medicine, and related health-care disciplines and have been used in previous systematic reviews examining the concepts of MS (Luca et al., 2022) and body image (Allen and Walter, 2016). Subject headings were identified by searching key words related to both MS and body image or interoception using Medical Subject Headings (MeSH) terms and database thesauruses. The search strategy incorporated a free text option to capture other relevant studies. The search focused on two main concepts, MS and body image or interoception, which were then combined (see Appendix 1 for details). Returned papers were hand searched for any relevant psychological outcomes to ensure that all relevant psychological variables were considered. The final search was conducted on 2nd November 2023.

Screening process

The search returned an initial 1024 studies, which were exported into a data management software. Duplicates were removed, and the remaining 555 papers were then screened for suitability. The first and third authors independently screened the title and abstracts of each of these papers, using the inclusion and exclusion criteria. Inconsistencies were discussed together and resolved without the need for a third reviewer. Following screening of title and abstracts, 21 papers remained for full screening. The first author searched the reference lists of each of these papers for further suitable studies. They identified one further study to screen in this process. Forward referencing identified a further two studies. This left 24 studies for full text screening. The first and third authors independently screened each of these papers for eligibility. No inconsistencies were found, leaving 13 studies for inclusion in the final review. A flow diagram of the selection process can be seen in Fig. 1.

Data extraction and quality assessment

Information extracted from studies included sample size, gender, mean age, MS type, disease duration, study design, measures of body image and psychological variable, outcomes of body image and psychological variable, relationship between body image and psychological outcomes, and correlation coefficient as a measure of effect size. The quality of the studies was assessed using the QualSyst tool, a 14-item survey for assessing and evaluating quantitative research papers in systematic reviews (Kmet et al. 2004). This tool was deemed sufficiently in-depth, and therefore the author made the decision to not use the Grade approach for assessing certainty of evidence (as previously stated via Prospero). The first author assessed the quality of each study at the stage of data extraction. The third author also performed this independently to minimise the risk of bias. Discrepancies were discussed together. The final summary scores were agreed by both parties.

Data synthesis and presentation

The extracted data were presented in tables and a narrative synthesis of studies was used to report patterns in the findings (Popay et al., 2006). To answer the research question, the studies were grouped based on psychological outcomes reported. Given the differences in study design, results from cross-sectional studies were presented separately to those of intervention studies. The p-values used were taken directly from included studies if in the format $p < .05$ and $p < .001$, or rounded up to ensure consistency.

Results

Quality appraisal

The scores from the quality appraisal ranged from 0.77 to 1, out of a possible 1, where 0 indicates poor quality, and 1 indicates high quality (see Table 1). The main reasons for reduced quality scores were: low sample sizes, the characteristics of the sample, or the research question not being sufficiently described. Some intervention studies lost points where, if feasible, randomisation was not done, or investigators were not blinded, as per tool guidelines.

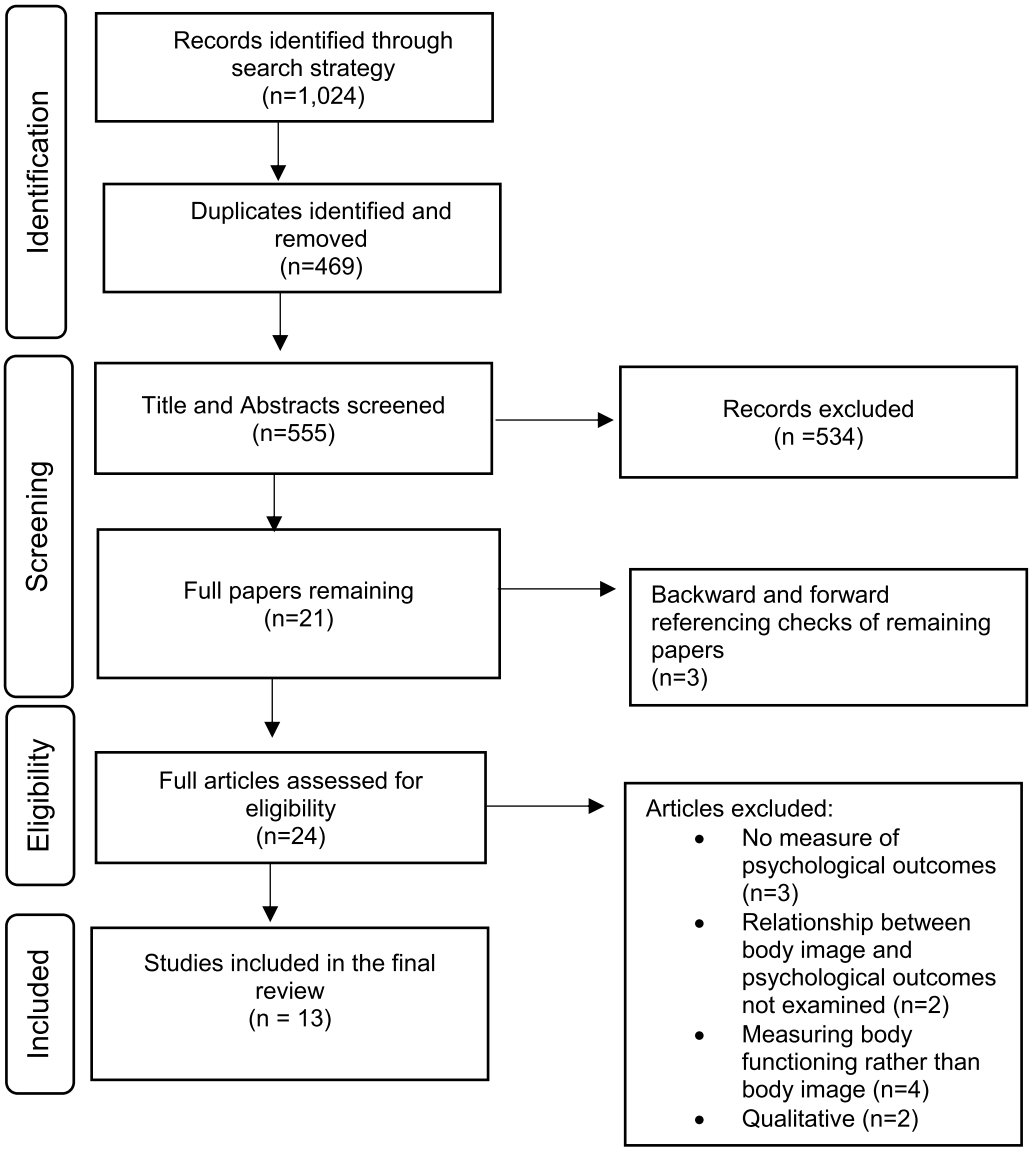

Fig. 1. Study Flow Chart.

General study characteristics

Ten of the studies included in this review were cross-sectional in design, and three were intervention studies. The sample size for studies ranged from 24 (Hernandez-Reif et al., 1998) to 395 (Ghodusi and Heidari, 2014), totalling 1533 participants across all studies. Nine studies reported on age, with a pooled mean age of 41.8 across each of these studies. Seven studies used the Expanded Disability Severity Scale (EDSS) to report on disability severity, with mean results ranging from 2.63 to 5.37, with higher scores indicating greater levels of disability. One study did not report a mean score, however the majority of participants (73 %) scored between 3.5 and 6.5, indicating moderate disability (Wilski et al., 2016). Nine studies reported disease duration, with a pooled mean of 8.2 years across these studies. Four studies (Barak et al., 1998; Barbosa et al., 2023; Pfaffenberger et al., 2011; Sengul et al., 2019) examined the difference in body image between individuals with MS and healthy controls. Three of these studies reported that people with MS had poorer body image than controls (Barak et al., 1998; Pfaffenberger et al., 2011; Sengul et al., 2019). A summary of studies included in the review are shown in Table 1.

Body image/interoception outcome measures

A total of 14 self-report questionnaires were used to examine body image and interoception across studies, with some heterogeneity across measures used. Most measures examined satisfaction in external body appearance, and two focused on interoceptive awareness (Barbosa et al., 2023; Paolucci et al., 2022). One of the measures examined how individuals think other people perceive their appearance (Barbosa et al., 2023). This was considered relevant because positive perceptions of body acceptance by others may foster positive body image in self (Wang et al., 2022). All measures were reported to be psychometrically robust.

Psychological outcomes

A total of nine measures were used to examine psychological outcomes across the studies. These measures examined depression, self-esteem, anxiety, QoL, emotional regulation, aggression, stress, and coping. The majority of measures to assess psychological outcomes were evidenced to be psychometrically reliable and robust.

Table 1
Study Characteristics.

Study	Country	Sample Size	% Female	Mean Age (SD)	% RRMS (% SPMS; & PPMS)	Disease Severity (EDSS)	Disease Duration	Study Type	Body Image/Interoception Measures	Psychological Measures	Effect size ***	Quality Appraisal
Barak et al. 1998	Israel	76	66 %	38.9	100 %	4.1 (1.4)	NR	Cross-sectional Study	Body Esteem Scale (BES)	Eysenck Self Esteem Scale	0.43	0.77
Barbosa et al. 2023	Portugal	305	70 %	46.13 (11.81)	21.5 % (6.2 %; 5.6 %)	NR	10.31 (9.59)	Cross-sectional Study	Body Appreciation Scale-2 (BAS-2); Body Acceptance by Others; Body Responsiveness Scale	The World Health Organization Quality of Life–BREF; Meaning of Life Scale; Difficulties of Emotional Regulation Scale	0.31*−0.46*	0.91
Farnam et al., 2017	Iran	60	50 %	NR	NR	NR	NR	Cross-sectional Study	Body Image Questionnaire	Index of Clinical Stress; The Self-Regulation Inventory; The Aggression Questionnaire	0.26 (Stress, Aggression)** 0.16 (Emotional Regulation)	0.85
Ghodusi and Heidari, 2014	Iran	395	70 %	36.68 (8.84)	NR	NR	3.51 (1.40)	Cross-sectional Study	Physical Disability Body Esteem Questionnaire	Rosenberg self-esteem questionnaire	0.63*	0.85
Kindrat, 2007	Canada	30	100 %	39.5 (8.7)	100 %	NR	7 (5.8)	Cross-sectional Study	Body-Image Ideals Questionnaire	The Beck Depression Inventory-Short Form	0.81*	0.9
Lo Buono et al., 2023	Italy	100	74 %	40.3 (11.6)	100 %	2.9 (1.6)	10 (7.4)	Cross-sectional Study	Body Image Scale	Rosenberg Self-Esteem Scale; Symptom Checklist-90-Revised	0.52 (Self-esteem) * 0.57 (Depression)* 0.50 (Anxiety)*	0.95
Pfaffenberger et al., 2011	Austria	68	73 %	37.35 (9.41)	NR	2.63 (1.66)	7.3 (5.16)	Cross-sectional Study	Questionnaire on body image	Beck Depression Inventory	0.14–0.59*	0.85
Sengul et al., 2019	Turkey	50	62 %	31.66 (7.88)	100 %	NR	NR	Cross-sectional Study	Body Cathexis Scale	Beck Anxiety Inventory; Beck Depression Inventory	0.57 (Anxiety)* 0.53 (Depression)*	0.9
Stevens et al., 2018	USA	151	66 %	46.1 (11.8)	68.9 % (17.2 %; 11.3 %)	NR	10	Cross-sectional Study	Body Shape Questionnaire	The Quality of Life in Neurological Disorders scale; Patient Health Questionnaire-9	NR	1
Wilski et al., 2016	Poland	185	100 %	49	34 % (22 %; 20 %)	Majority moderate (73 %)	14 (9.7)	Cross-sectional Study	Body Esteem Scale	Rosenberg Self-Esteem Scale; Actually Received Support Scale; Multiple Sclerosis Impact Scale	0.48 (Self-esteem) *	1
Hernandez-Reif et al., 1998	USA	24	75 %	47.5 (10.9)	NR	5.25 (1.45)	NR	Intervention	Multidimensional Body-Self Relations Questionnaire (modified for MS)	State Anxiety Inventory; Profile of Mood States Depression Scale; Rosenberg Self-Esteem Scale	NR	0.85
Paolucci et al., 2022	Italy	60	72 %	41.84 (10.28)	100 %	5.37 (3.22)	5.37 (3.22)	Intervention	Multidimensional Assessment of Interoceptive Awareness; Tinetti Mobility Test; Trunk Appearance Perception Scale; Body Image Scale.	12-Item Short From Health Surey	NR	0.96
Tesar et al., 2003	Austria	29	86 %	36.9 (6.7)	NR	2.7 (1)	4.6 (3.2)	Intervention	Body image questionnaire	Beck Depression Inventory; Freiburg disease coping questionnaire; State anxiety inventory	NR	0.77

*$p \leq 0.01$
**$p<.05$
***reported in study

Relationship between body image and psychological outcomes

Depression

Four studies looked at the relationship between body image and depression in MS, using either Pearson's or Spearman's correlation analysis (Kindrat, 2007; Lo Buono et al., 2023; Pfaffenberger et al., 2011; Sengul et al., 2019). All of these studies reported a significant positive relationship between the two concepts, indicating that a positive body image was associated with lower levels of depression. Large effect sizes were reported across these studies, ranging from 0.53 (Pfaffenberger et al., 2011; Sengul et al., 2019) to 0.81 (Kindrat, 2007).

Two studies examined this relationship further using regression analysis. Lo Buono et al. (2023) reported that the depression dimension of the SCL-90-R was a significant predictor of body image ($p < .05$) in a Poisson regression. Stevens et al. (2018) used hierarchical linear regression to demonstrate that sex, BMI and depression were all significant predictors of body image ($p < .05$).

Anxiety

Two studies examined the relationship between body image and anxiety in MS using correlation analysis (Lo Buono et al., 2023; Sengul et al., 2019). Both studies found a positive significant relationship between the two variables, with higher levels of body dissatisfaction associated with higher levels of anxiety ($p < .001$). Similar to previous findings regarding depression, both of these studies reported large effect sizes: 0.5 (Lo Buono et al., 2023) and 0.57 (Sengul et al., 2019).

Self-esteem

Three studies used Spearman's correlation to examine the relationship between body image and self-esteem in MS. Two studies (Ghodusi and Heidari, 2014; Wilski et al., 2016) reported significant positive correlations ($p < .001$) indicating that higher levels of body satisfaction were associated with increased self-esteem. The effect sizes were 0.48 and 0.63. While this relationship did not reach statistical significance in the study by Barak et al. (1998), the effect size was similar, at 0.43. The study may not have reached significance due to the sample size ($n = 76$) being lower than that of the other two ($n = 395$; $n = 185$)

Quality of life

Two studies used correlation analyses to examine the relationship between body image or interoception and QoL (Barbosa et al., 2023; Wilski et al., 2016). Both studies reported significant relationships between body image and QoL, with effect sizes ranging from 0.44 to 0.48. Barbosa et al. (2023) reported a significant relationship between interoception and QoL (effect size 0.31). Results indicated that positive body image and higher levels of interoception was associated with better QoL.

Regression analyses explored this relationship further. Wilski et al. (2016) examined predictors of body-esteem. All aspects of QoL, other than the physical dimension, were found to be significant predictors of body-esteem ($p \leq 0.001$). Stevens et al. (2018) similarly looked at predictors of body image, however this study found that QoL was not a significant predictor of body image and instead significant predictors of body image were found to be sex, body mass index, and low mood. Considering the relationship in the opposite direction, Barbosa et al. (2023) investigated variables that predicted QoL. They found that 40.6 % of the variance in general QoL was explained by all independent variables in the predictor model, which consisted of body functionality, meaning of life, body appreciation by others, body appreciation by self, and emotional regulation. The study reported that body appreciation accounted for 13 % of variance in psychological QoL. Body acceptance by others accounted for 3.7 % and 1.3 % of variance in social QoL and environmental QoL, respectively. All of these studies used different measures to assess QoL (see Table 1).

Other psychological outcomes

Farnam et al. (2017) used Pearson's correlation to examine the relationship between body image and emotion regulation, aggression, and stress. The researchers reported a significant negative correlation between body image and aggression ($p < .05$) and stress ($p < .05$), indicating that higher levels of body satisfaction were associated with lower levels of both aggression and stress. Similar effect sizes (0.26) were reported. No significant correlation was reported between body image and emotion regulation ($r = 0.16$, $p > .05$).

In one regression analysis, body image was a predictor of stress. Across the six subscales of body image, appearance evaluation, body area satisfaction (an individual's satisfaction in specific aspects of their body), and fitness orientation (the extent to which an individual values being physically fit) accounted for 27 % of variance in stress. In another regression analysis predicting aggression, body image was again a significant predictor. Fitness evaluation was entered in the first step of the analysis, and accounted for 17 % of variance in aggression; fitness evaluation and body area satisfaction were entered in the second step of the analysis, and they accounted for 23 % of variance in aggression.

Intervention studies

Aim of interventions

Three studies examined body image or interoception and psychological outcome before and after a given intervention. While these studies did not directly examine the relationship between body image or interoception and psychological outcomes, variables that move together may be indicative of possible correlation (Bewick et al., 2003).

The first of these studies aimed to assess whether a five-week massage intervention would improve body image and self-esteem in individuals with MS (Hernandez-Reif et al., 1998). A second intervention study by Tesar et al. (2003) examined the effects of a seven-week psychological therapy on anxiety and body image. The researchers integrated elements of Cognitive Behavioural Therapy (CBT) with specialised techniques such as relaxation and visualisation to increase participants' body awareness. Paolucci et al. (2022) assessed whether an eight-week programme consisting of physiotherapy and neurocognitive exercises, based on proprioception, body relaxation and breathing, would improve body image, interoception, and QoL.

Results of intervention studies

Two of the studies reported that there was an improvement in both body image or interoception, and psychological outcomes following intervention. Following massage therapy, participants reported improved self-esteem ($p < .05$) and body satisfaction ($p < .05$) (Hernandez-Reif et al., 1998). The physiotherapy and neurocognitive intervention (Paolucci et al., 2022) saw improvements in body image, with regards to body satisfaction ($p < .001$) and interoceptive awareness ($p < .05$), as well as QoL ($p < .05$). While Tesar et al. (2003) reported a significant reduction in depression and depressive coping for participants following the psychological therapy intervention, there were no significant changes found in body image scores. The researchers concluded that the effects of the therapy were weaker for body image, compared with the effects on coping and affect, however, reasons for this were not proposed. It might be that the exercises employed by the intervention to focus on body awareness and muscle relaxation are more associated with interoception, and less helpful for body image in its traditional sense. Interventions using exercises aimed at improving body image and one's sense of satisfaction in their bodies may have yielded different results.

Discussion

The aim of this systematic review was to examine the association between body image and psychological wellbeing in MS. The limited number of studies included in this review ($n = 13$) suggests that there has been little focus on this relationship to date. However, findings provide preliminary evidence to suggest that body image has important

psychological implications for this population. Overall, the findings from this review suggest that positive body image is associated with lower psychological distress, although the causal direction of this relationship remains unclear.

The relationship most frequently examined was between body image and depression. This present review demonstrated that a more positive body image was associated with lower levels of depression, with moderate to large effect sizes reported. Similar findings have been seen in other long-term health conditions such as diabetes (Lee and Song, 2002), and head and neck cancer (Rhoten et al., 2014). The direction of this relationship, in terms of cause and effect, however, remains unclear. There have been suggestions that depression can exacerbate body image dissatisfaction (Marsella et al., 1981), therefore it might be that people experiencing lower mood are more likely to appraise themselves negatively. Conversely, it might be that greater concern about one's body image may lead to lower mood (Di Cara et al., 2019).

A more positive body image was associated with reduced levels of anxiety in MS, however the direction was again unclear. It is notable that the measures used to assess anxiety in the present review viewed anxiety broadly, rather than specifying the specific type of anxiety. There has been previous research evidencing an association between body concern and social anxiety in student populations (Bakhtiarpoor et al., 2011). It might be that perceived stigma associated with body image changes in MS may increase a person's sense of social anxiety, however further research is needed to better understand the nature of this relationship.

A more positive body image was associated with higher levels of self-esteem. This supports earlier findings reporting an association between body image and self-esteem in both people with MS (Di Cara et al., 2019) and the general population (Kostanski and Gullone, 1998). The link between body image and self-esteem is perhaps not surprising given the role that body image plays in a person's identity and sense of self (O'Dea, 2012). Existing literature reports that the progression of MS has a negative effect on an individual's self-esteem (Robati and Shareh, 2018). It is possible that lower levels of self-esteem arising from MS may lead to individuals experiencing their bodies in a more negative way. On the other hand, it is possible that physical changes in the body arising from MS may lead to lower levels of self-esteem.

The findings from this review suggest that positive body image and higher levels of interoception are associated with higher levels of QoL. These findings support earlier research demonstrating an association between body image and QoL, both within the general population (Nayir et al., 2016) and in other long-term health conditions (Akkaya et al., 2012). Increased disease severity may be associated with increased gait difficulties or sensory problems, which may negatively affect QoL, and may cause individuals to view their bodies in a less positive way. Stigma may also play a role in this relationship; individuals with higher levels of body dissatisfaction may be more likely to withdraw from social activities due to perceived stigma or social anxiety (Lillis et al., 2011). It is likely that the psychological processes underlying the relationship between body image and QoL will differ across varying aspects of QoL, such as environmental, physical or social. Future qualitative research may be helpful in disentangling these subtle differences.

There was a high level of heterogeneity across the studies in terms of measures used to assess body image and interoception. The variability in findings may reflect the different dimensions of these distinct concepts under investigation. Interestingly, the studies that used similar body image measures were most consistent in their findings. Two of the studies examining the relationship between body image and self-esteem used the Body Esteem Scale (BES) to assess body image (Barak et al. 1998; Wilski et al., 2016). The third study examining this relationship used the Physical Disability Body Esteem Questionnaire (PDBEQ), an alternative measure to assess the same construct (Ghodusi and Heidari, 2014). The results from these studies were consistent in terms of effect size reported. Importantly, while Barbosa et al. (2023) reported a significant relationship between QoL and both body image and interoception, it was noted that the effect size was lower for the latter relationship.

There was diversity across the studies in terms of where the studies took place. Seven studies were published in Europe, three in North America, and three in Asia. It is likely that participants from different cultural backgrounds relate to their bodies in different ways, with previous research indicating differences in body image across diverse ethnic groups (Ricciardelli et al., 2007). These cultural differences in body image may have accounted for some of the variation in effect sizes reported within this review, however strong conclusions cannot be made due to the small number of studies. Despite the diversity in countries, this review excluded non-English studies, thus introducing a risk of bias (Lefebvre et al., 2023), and a potential lack of cultural representation.

Clinical implications

The findings of the review indicated that a more positive body image was associated with better mood, lower anxiety, increased self-esteem, greater QoL, and lower levels of stress. While the causal nature of these associations was not clear, it is likely that they may be bidirectional. Therefore, psychological interventions that target body image may have a positive impact on psychological outcomes, and potentially vice versa.

While evidence is limited, the majority of research regarding the efficacy of psychological interventions for body image (other than those identified in the present review) come from oncology literature. A review by Sebri et al. (2021) reported that interventions including cognitive, social, mindfulness, and art therapy, were effective in reducing body image concerns among individuals with breast cancer. It is possible that such interventions may also be helpful in targeting body image in MS, but these have not yet been systematically explored. There has been some evidence suggesting that CBT may be helpful in improving body image among the general population (Alleva et al., 2015; Jarry and Ip, 2005; Rosen et al., 1989). CBT has also been shown to have a positive effect on both image and sexual functioning in people with breast cancer (Hummel et al.,2018). While research regarding the efficacy of other psychological models for body image remain largely understudied, it is possible that other interventions may be helpful in MS populations. Shame may be particularly relevant when working with individuals with lower body image, as they can often experience negative feelings for not reaching socially desirable body standards (Duarte et al., 2015), thus supporting a Compassion Focused Therapy (CFT) approach (Gilbert, 2014). Acceptance and Commitment Therapy (ACT) may be helpful to support people to come to terms with changes in their bodies as a result of MS, with evidence suggesting an association between acceptance and better adjustment in this population (Pakenham and Fleming, 2011).

Limitations

There has been little research conducted looking specifically at the relationship between body image or interoceptive awareness and psychological outcomes in MS, and the included studies varied greatly in terms of both methodology and analysis. The differences across these studies, such as differences in outcome measures or psychological concepts under examination, posed challenging to creating a meaningful narrative synthesis. Secondly, there were limitations in terms of study design and statistical analysis. The majority of included studies were cross-sectional in design, which can make it difficult to infer causation and directionality of associations (Chirico, 2023). In addition, this review examined two distinct concepts, which encompass the appraisal of external appearance and interoceptive awareness. While it was helpful to include studies that examined both appraisal of external appearance and interoceptive awareness, due to limited research in this area, the broad definition of body image created challenges in terms of heterogeneity across studies, and data synthesis.

In light of these limitations, future research would benefit from

longitudinal study designs, which have been reported to be more valid for examining cause and effect relationships (Caruana et al., 2015). More detailed analysis would also be helpful to explore the direction of associations between body image and psychological outcomes. Finally, further research to compare the psychometric properties of body image and interoception measures would be helpful to ensure consistency going forward.

Conclusion

This review highlights the limited research into body image and MS. It offers preliminary evidence to suggest that a more positive body image is associated with better mood, lower anxiety, increased self-esteem, greater QoL, and lower levels of stress. Further research is recommended to explore these associations, and to understand psychological processes underlying the relationship between body image and psychological outcomes in MS. Increased understanding will allow clinicians to design interventions appropriately in support of a holistic and person-centred approach to care.

CRediT authorship contribution statement

Derval McCormack: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Dr Fiadhnait O'Keeffe:** Writing – review & editing, Supervision, Project administration, Conceptualization. **Christina Seery:** Validation, Data curation. **Dr Fiona Eccles:** Writing – review & editing, Supervision, Project administration, Conceptualization.

Declaration of competing interest

None

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Appendix 1

Database Search Strategy
CINAHL [128 hits]

Concept 1 Multiple Sclerosis	Concept 2 Body Image
• MH "Multiple Sclerosis+" • MH "Demyelinating Diseases+" • Free text: "multiple sclerosis" OR MS OR "demyelinating disease" OR "relapsing remitting" OR "sclerosis" OR ("autoimmune disease" N3 "nervous system")	• MH "Body Image+" • MH "Body Dissatisfaction" • MH "Intraoperative Awareness" • Free text: "body image" OR "body percep*" OR "body dissatisfac*" OR "body satisfac* OR "body esteem" OR "body aware*" OR "body interocept*" OR "body-image" OR "body-percep*" OR "body-dissatisfac*" OR "body-satisfac*" OR "body-esteem" OR "body-aware" OR "body-interocept*" OR "body concept" OR (body N5 (image OR percep* OR satisfac* OR disatisfact* OR esteem OR aware* OR self-percep* OR self-percep* OR concept)

MEDLINE [339 hits]

Concept 1 Multiple Sclerosis	Concept 2 Body Image
• MH "Multiple Sclerosis • MH "Multiple Sclerosis, Chronic Progressive" • MH "Multiple Sclerosis, Relapsing-Remitting" • Free text: "multiple sclerosis" OR "MS" OR "demyelinating disease" OR "relapsing remitting" OR "sclerosis" OR ("autoimmune disease" N3 "nervous system")	• MH "Body Image+" • MH "Body Dissatisfaction" • MH "Intraoperative Awareness" • Free text: "body image" OR "body percep*" OR "body dissatisfac*" OR "body satisfac* OR "body esteem" OR "body aware*" OR "body interocept*" OR "body-image" OR "body-percep*" OR "body-dissatisfac*" OR "body-satisfac*" OR "body-esteem" OR "body-aware" OR "body-interocept*" OR "body concept" OR (body N5 (image OR percep* OR satisfac* OR disatisfact* OR esteem OR aware* OR self-percep* OR self-percep* OR concept)

PsycINFO [169 hits]

Concept 1 Multiple Sclerosis	Concept 2 Body Image
• DE "Multiple Sclerosis" • DE "Sclerosis (Nervous System)" • DE "Demyelination" • Free text: "multiple sclerosis" OR MS OR "demyelinating disease" OR "relapsing remitting" OR "sclerosis" OR ("autoimmune disease" N3 "nervous system")	• DE "Body Image" • DE "Body Awareness" • DE "Body Dissatisfaction" • DE "Body Esteem" • Free text: "body image" OR "body percep*" OR "body dissatisfac*" OR "body satisfac* OR "body esteem" OR "body aware*" OR "body interocept*" OR "body-image" OR "body-percep*" OR "body-dissatisfac*" OR "body-satisfac*" OR "body-esteem" OR "body-aware" OR "body-interocept*" OR "body concept" OR (body N5 (image OR percep* OR satisfac* OR disatisfact* OR esteem OR aware* OR self-percep* OR self-percep* OR concept)

SCOPUS [388 hits]

Concept 1 Multiple Sclerosis (TITLE-ABS ({multiple sclerosis} OR {MS} OR {demyelinating disease} OR {relapsing remitting} OR {sclerosis} OR ({autoimmune disease} W/3 {nervous system})))	Concept 2 Body Image (TITLE-ABS ({body image} OR {body percep*} OR {body dissatisfac*} OR {body satisfac*} OR {body esteem} OR {body aware*} OR {body interocept*} OR {body-image} OR {body-percep*} OR {body-dissatisfac*} OR {body-satisfac*} OR {body-esteem} OR {body-aware} OR {body-interocept*} OR (body W/5 (image OR percep* OR satisfac* OR disatisfact* OR esteem OR aware* OR self-percep* OR self-percep*))))

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