

Experiences of self-monitoring in self-directed weight loss and weight loss maintenance: systematic review of qualitative studies

Abstract

The experience and role of self-monitoring in self-directed weight loss attempts may be distinctly different from that within formal interventions, and has yet to be fully explored. We systematically reviewed qualitative studies to examine experiences of self-monitoring as an aid to self-directed weight loss. Thematic synthesis was used to construct descriptive and analytical themes from the available data. 22 studies (681 participants) were included, in which the uses of self-monitoring ranged from an aid to increase adherence to a tool for facilitating analysis. Self-monitoring also influenced and was influenced by self-perception and emotions. Feelings of shame were linked with abandonment of efforts. Findings highlight the centrality of interpretation of self-monitored data, the implications this interpretation has on sense of self, and the impact of broader discourses. Explicitly framing self-monitoring as a positive tool with which to aid analysis may encourage helpful use of this technique.

Background

Self-monitoring has long been conceptualised as an agent for behaviour change. Defined as the procedure by which individuals record their own target behaviours (Nelson & Hayes, 1981), it has been found to lead to decreases in unwanted behaviours and increases in desired behaviours in a number of areas, including diet and physical activity (Butryn, Phelan, Hill, & Wing, 2007; Fletcher, Hartmann-Boyce, Hinton, & McManus, 2015; Guare et al., 1989; S. Michie, Abraham, Whittington, McAteer, & Gupta, 2009; Quinn, Pascoe, Wood, & Neal, 2010). Self-monitoring is often described as a central component of behavioural treatment for weight loss (Burke, Wang, & Sevick, 2011); within this context it may include monitoring dietary intake, physical activity, and outcomes including weight, size, body shape, and/or physical fitness measures (J. Hartmann-Boyce, Aveyard, Koshiaris, & Jebb, 2016).

Self-monitoring is relatively ubiquitous in weight loss attempts and interventions, and is often recommended and enacted within these contexts (J Hartmann-Boyce, Jebb, Fletcher, & Aveyard, 2015; J Hartmann-Boyce, Johns, Jebb, Aveyard, & Behavioural Weight Management Review Group, 2014). Research suggests self-monitoring is also commonly used by people trying to lose weight on their own, without support from an intervention or health professional (Fox & Duggan, 2012; J Hartmann-Boyce et al., 2016). The experience and role of self-monitoring in this context, however, may be distinctly different from that of self-monitoring within the framework of a formal intervention (Madigan, Daley, Lewis, Aveyard, & Jolly, 2015).

Multiple explanations have been offered as to how and why self-monitoring facilitates behaviour change. As habitual behaviour is usually 'automatic,' execution of the behaviour tends to be at least partially unconscious (Bargh, 1994). Therefore, it follows that self-monitoring may work through bringing habitual behaviour into conscious awareness

(Hermesen, Frost, Renes, & Kerkhof, 2016). According to Kanfer's self-regulation theory, self-monitoring also precedes evaluation of progress towards one's goal or goals, and reinforces the progress made (Kanfer & Gaelick, 1975). However, in practice, studies have found that self-monitoring facilitates weight loss for some people and not for others, suggesting there may be multiple mechanisms at play (Madigan et al., 2015).

Recently, there has been a rise in interest in self-tracking, stemming from the availability and use of technologies to monitor and log personal data. This movement is commonly referred to as the quantified self (Lupton, 2016). Work from Lupton on this topic has highlighted the role of self-tracking in facilitating self-analysis in some individuals, and of particular relevance to this article, has drawn on the work of Foucault to explore the interplay between societal constructs of 'good citizenship', morality, and self-knowledge (Lupton, 2016). Other work from Lupton has explored the Foucauldian discourses within the context of obesity specifically, critically evaluating the impact of these societal constructs on individual well-being and obesity stigma and shame (Lupton, 2013).

Despite the number of adults trying to lose weight without professional support and the apparent frequency of self-monitoring within this population, little research has explored the role of self-monitoring in self-directed weight loss attempts, particularly in light of its varying effectiveness across individuals. In this article, we present results from a systematic review of qualitative studies of self-directed weight loss. We focus on the different forms and roles self-monitoring takes within these weight management attempts and the mechanisms through which these differences may interact with weight change trajectories. We finish by viewing the results through the lens of both self-regulation theory and themes related to societal constructs of 'good citizenship'.

Methods

This analysis represents a separate analysis of a subset of studies from a systematic review of qualitative studies of self-directed weight loss [*reference removed to preserve blinding*]. A short summary of methods are reported here as they relate specifically to this analysis. More detail can be found in the published overview and on the protocol [*reference removed to preserve blinding*].

Search

Seven electronic databases were systematically searched in December 2015 (CINAHL, EMBASE, MEDLINE, PsycINFO, Science Citation Index Expanded, Social Science Citation Index, Conference Proceedings Citation Index – Science) for qualitative studies using terms related to qualitative research methodologies (using terms proposed by Cochrane (Booth, 2011)), obesity, weight loss, diet, exercise, behaviour change and self-care (with terms for the latter adapted from a recent systematic review of self-help interventions for weight loss (Hartmann-Boyce et al., 2016)). MEDLINE search terms are listed in full on PROSPERO [*reference removed to preserve blinding*]. We also screened reference lists of included studies and relevant systematic reviews for further studies.

Inclusion Criteria

We included qualitative studies conducted in community and primary care settings, of adults (18 or older) who had attempted or were attempting to lose weight through behaviour change. The interest of this particular analysis was self-monitoring strategies used by participants in self-directed efforts to lose weight. We did not exclude studies on the basis of quality.

Screening and data extraction

One reviewer screened titles and abstracts for inclusion, with a sample of 10% checked by a second reviewer (agreement rate 100%). Full text was screened by one reviewer. Data

extraction was conducted using a tailored form derived for the main study [anon for peer review]. To appraise the quality of the included studies, we employed the Critical Appraisal Skills Program (CASP) for qualitative studies (Critical Appraisal Skills Programme (CASP), 2013), a widely used qualitative appraisal tool. Both data extraction and quality appraisal were conducted independently by two reviewers.

Analysis

We adopted an interpretivist approach to conduct this review. Levack (2013, p.392) argues that metasynthesis is ‘a natural step in the development of interpretivist methods in general’. It involves the reinterpretation of interpretations and encourages the development of new insights and concepts. Adopting an interpretivist approach to metasynthesis allowed us to acknowledge the importance of context and analyse with the study specific context in mind. Moreover, interpretivism fits with thematic synthesis, the analytic approach we followed, set forth by Thomas and Harden (Thomas & Harden, 2008) and detailed by Major and Savill-Baden (Major & Savin-Baden, 2010). Data were entered into NVivo11 (*NVivo qualitative data analysis software*, 2010) and analysis was led by [removed to preserve blinding], with discussion with other members of the study team to agree on codes, synthesis and interpretation of themes. First and second order themes were identified and analysed using an inductive approach, with an open coding framework used and new themes gathered from the data as they emerged. The interpretation of third order themes was aided by analysing inductively-derived themes through the lens of both self-regulation theory and societal constructs of good citizenship as explored by Lupton (Kanfer & Gaelick, 1975; Lupton, 2013; Lupton, 2016).

Results

Characteristics of included studies

Excluding duplicates, searches yielded 2,285 references (see Figure 1). Twenty-two articles are included in this analysis, representing 681 participants. Table 1 displays included studies with brief detail. Overall, the study populations were largely homogenous between studies.

All included studies focussed on something broader or different from self-monitoring. Some compared people who had maintained weight loss and those who had regained lost weight; these studies used “maintainer” and “regainer” to describe these groups.

Figure 1 PRISMA diagram of study flow

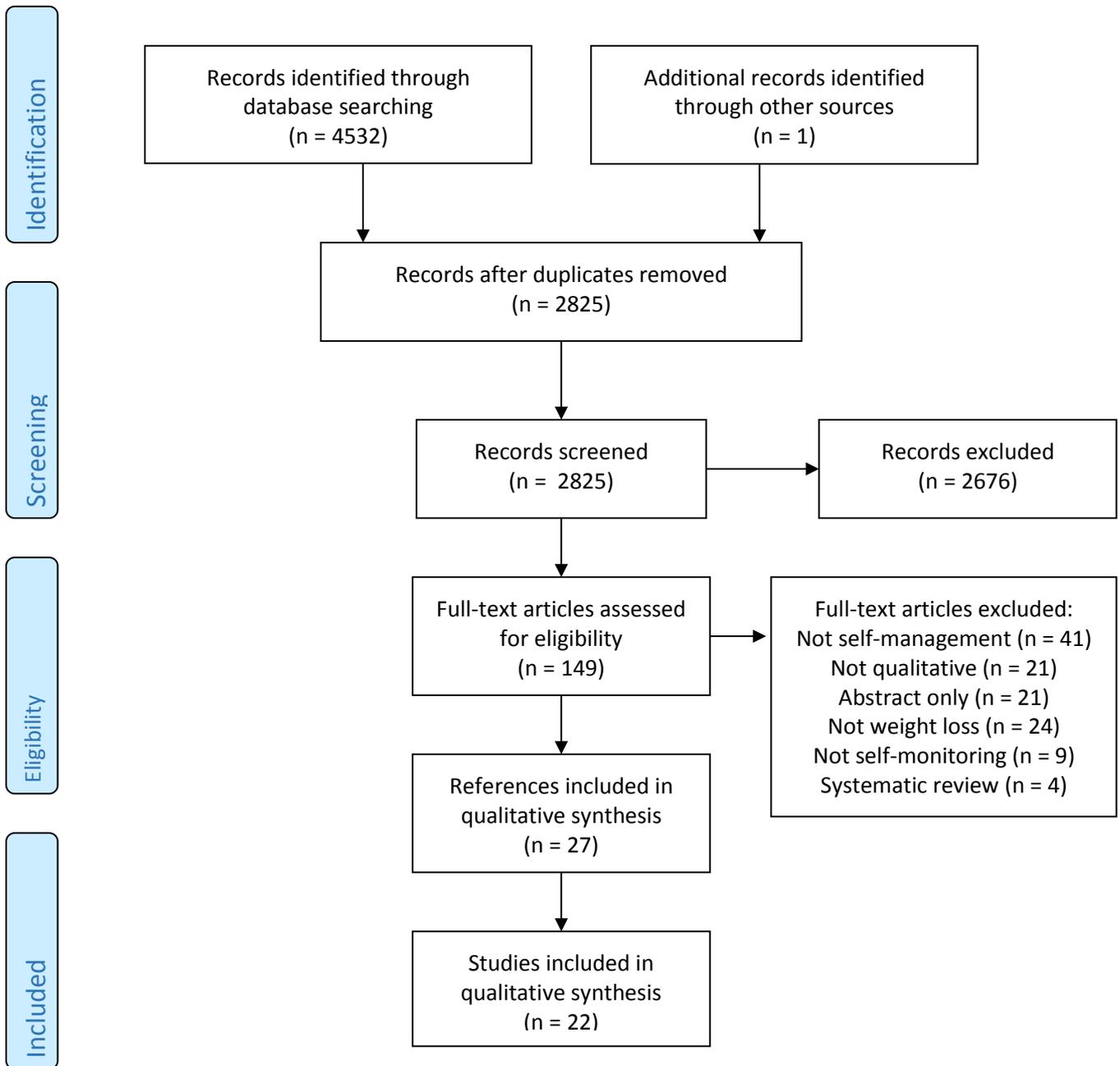


Table 1. Included studies (last search Dec 2015)

Reference	Country	Focus	N
(Abolhassani et al., 2012)	Iran	Barriers and facilitators to weight gain & loss	11
(Allan, 1991)	USA	Weight management in white women	37
(Barnes et al., 2007)	USA	Weight loss maintenance as it relates to the theory of planned behaviour	37
(Bennett & Gough, 2013)	UK	How men communicate about their bodies, weight management and masculinities	11 6
(Bidgood & Buckroyd, 2005)	UK	The experiences and feelings of adults with obesity about weight loss attempts and maintenance	18
(Byrne, Cooper, & Fairburn, 2003)	UK	Psychological factors associated with successful and unsuccessful weight maintenance	56
(Chambers & Swanson, 2012)	UK	Long term weight maintenance	14
(Collins, 2012)	USA	Perceptions of individuals after self-guided weight loss who had previously had obesity	11
(Davis, 2014)	USA	Experiences of college students in the weight-loss process	5
(Green, Larkin, & Sullivan, 2009)	UK	Phenomenology of repeated diet failure	11
(Heading, 2008)	Australia	Risk logics, embodiment, issues related to obesity in adults	19
(Hindle & Carpenter, 2011)	UK	Experiences, perceptions and feelings of weight loss maintainers	10
(Hwang et al., 2010)	USA	Social support for weight loss in web community	13
(Jaksa, 2011)	USA	Experience of maintaining substantial weight loss	12
(Karfopoulou, Mouliou, Koutras, & Yannakoulia, 2013)	Greece	Weight loss maintenance and Mediterranean diets	44
(Macchi, 2007)	USA	Process of meaning-making associated with weight loss and maintenance	10
(McKee, Ntoumanis, & Smith, 2013)	UK	Weight maintenance	18
(Reyes et al., 2012)	USA	Weight loss maintenance	29
(Sanford, 2010)	US, UK, Canada	Weight loss blogs	50
(Stuckey et al., 2011)	USA	Successful weight loss maintenance practices	61
(Su, Lin, Chu, Huang, & Tsao, 2015)	Taiwan	Taiwanese perimenopausal women's weight loss experience	18

Reference	Country	Focus	N
(Tyler, Allan, & Alcozer, 1997)	USA	Weight loss methods among women	80
(Witwer, 2014)	USA	Weight loss maintenance	12

Quality was mixed across the included studies. Approximately half had potential issues with recruitment methods, and fewer than half demonstrated that the role of the researcher had been considered and that data analysis was sufficiently rigorous (Table 2). Items on the CASP were appraised as ‘unclear’ when information was absent or the information provided was insufficient to judge its quality.

Table S2 Summary of CASP judgements

CASP question	Number of answers across all included studies		
	Yes	Unclear	No
Was there a clear statement of the aims of the research?	21	0	1
Is a qualitative methodology appropriate?	21	1	0
Was the research design appropriate to address the aims of the research?	17	4	1
Was the recruitment strategy appropriate to the aims of the research?	11	6	4
Was the data collected in a way that addressed the research issue?	17	4	1
Has the relationship between researcher and participants been adequately considered?	5	14	3
Have ethical issues been taken into consideration?	13	8	1
Was the data analysis sufficiently rigorous?	9	8	5
Is there a clear statement of findings?	10	9	3
Is the research valuable?	18	3	1

Behaviours and outcomes being monitored

The elements monitored by participants varied, but most commonly involved food intake and weight. Other monitored behaviours included physical activity and water intake, and other monitored outcomes included visual inspection (e.g. looking in a mirror), clothing size, fit of clothing, body fat percentage, and physical fitness measures. Data were coded based not only on themes but also on the element being monitored; after coding and analysis it became clear

that the themes related to a range of elements; no themes related to only one element, and no element related to only one theme. We therefore discuss these different forms of monitoring under each theme but explicitly state which element is being monitored.

Analytical themes

Three main analytical themes and a range of sub-themes emerged and are introduced and discussed further below, both individually and in relation to one another.

Self-perception and emotions

Multiple studies discussed the role of self-monitoring as fostering ‘ownership’ and self-knowledge amongst participants, increasing participants’ ability to understand and control their own behaviour. In a Taiwanese study, perimenopausal participants spoke of learning to ‘listen’ to their bodies through self-monitoring: “I feel that my body is “talking” to me, and I listen to its voice” (Su et al., 2015). It was also noted that self-monitoring revealed new knowledge which, in turn, facilitated successful weight management, with a maintainer explaining, “you never know how much you eat until you start counting calories” (Collins, 2012). Another maintainer explained how consciously monitoring her emotions helped her ‘tighten up the reins’ when it came to emotional eating (Jaksa, 2011). One maintainer referred to the scale as “my best friend” – she weighed herself every day and viewed the scale as a consistent and reliable presence that increased her self-knowledge (Reyes et al., 2012). Thus, these studies suggested that self-monitoring led to an increase in self-knowledge by increasing awareness.

Whilst this self-knowledge was predominantly viewed as a positive aspect of self-monitoring linked to increased weight loss and maintenance success (Hindle & Carpenter, 2011), in a study investigating the experiences of weight loss attempts in adults with obesity, anticipated ‘ownership’ was found to be a barrier to self-monitoring. One woman said recording her food

intake was “the hardest thing... Maybe it’s the ultimate ownership of what I’m doing” (Bidgood & Buckroyd, 2005). Other studies in which self-monitoring instigated feelings of shame found it often coincided with weight regain (Chambers & Swanson, 2012; Reyes et al., 2012; Sanford, 2010). For some, the anticipation of shame led to feelings of fear, which led to avoidance behaviours and ultimately discouraged the practice of self-weighing in particular. A regainer explained, “When jeans don’t fit, you’re scared to get on. I used to weigh myself. It doesn’t happen anymore” (Reyes et al., 2012). Another regainer explained, “I was too frightened to get on the scales. I knew that if I weighed myself and I had put on, then I’d just go off the rails, and eat and eat” (Byrne et al., 2003).

As illustrated above, participants were less likely to engage in monitoring when they anticipated the recorded outcome would elicit a negative emotional response. In the maintenance phase, anticipating weight gain had the potential to deter the practice of self-weighing (Chambers & Swanson, 2012; McKee et al., 2013; Reyes et al., 2012). A male regainer, who was very attuned to his weight, did not wish to see it on scale: “I avoid the scale at all costs. And even when I do get on it, I know within 3 pounds what it’s going to say. I avoid it because I don’t want to see it” (Reyes et al., 2012). Conversely, if participants anticipated a positive emotional response, they were more likely to monitor: “I feedback off seeing the weight coming down . . . I like to see it happening very quickly and therefore I actually want to keep weighing myself” (Chambers & Swanson, 2012). Multiple study authors highlighted that maintainers consistently and frequently engaged in self-monitoring as opposed to regainers whose monitoring tailed off once weight loss had been achieved (Byrne et al., 2003; Chambers & Swanson, 2012; Jaksa, 2011; McKee et al., 2013). Often, this observation was used to imply that ceasing self-monitoring led to weight regain, but data here suggest that regain led to ceasing self-monitoring.

Attentive and reactive self-monitoring

Regardless of whether the feedback received was positive or negative, participant accounts illustrated an array of ways in which self-monitoring influenced their behaviour. Sometimes, self-monitoring served as a way to increase attention and adherence to desired behaviour change. This is in line with behaviour change theories which suggest that self-monitoring may work by bringing habitual behaviour into conscious awareness (Hermsen et al., 2016; Kanfer & Gaelick, 1975). For example, in a UK study of weight loss maintenance, a participant who had been tracking his food and exercise for the past five years explained, “As long as you’re counting something, either calories or grams of fat, it’s helpful. I think it’s that little mind trickery of it, it makes it present in the mind...” (McKee et al., 2013). In this particular case, the mechanism through which self-monitoring aided adherence to behaviour change was on the individual level, through monitoring the target behaviour. In other studies, adherence was enhanced by sharing of self-monitored data with others, which included outcome data such as weight (Hwang et al., 2010; Sanford, 2010).

In contrast to using self-monitoring to enhance adherence, a separate group of participants used self-monitoring to facilitate self-analysis, typically through analysing recorded outcomes in light of recorded behaviours (Collins, 2012; Hindle & Carpenter, 2011; Su et al., 2015). In a Taiwanese study of perimenopausal women’s experience with weight loss, one participant explained, “I measure my weight every day... I often ask myself: did I eat too much recently? Otherwise, why did my weight increase?” (Su et al., 2015). In their cohort of British weight loss maintainers, Hindle and Carpenter explain how self-monitoring allowed participants to quickly identify changes in target behaviours or outcomes and judge the impact of these (Hindle & Carpenter, 2011). In a study of American weight loss maintainers, one participant explained, “I will gain a few pounds and so then I want to analyse it, ’Why did you gain that weight? ... What has caused this?’ ... the six or seven months after I’d actually lost the

weight, it became more of a self-analysis...it became, in my mind, an analysis of why it was successful and how to keep it going” (Macchi, 2007).

Regardless of whether self-monitoring was primarily used for adherence or analysis, participants spoke of how its outcomes could serve as a prompt for action (Barnes et al., 2007; Chambers & Swanson, 2012; Reyes et al., 2012). One maintainer explained, “I need to know exactly what it’s [weight] at and then if it’s creeping up then I need to take corrective action” (Chambers & Swanson, 2012). In a separate study, a maintainer explained, “If I put them [jeans] on and I feel this is not fitting the way it did yesterday, or the week before, that tells me right then that there’s something I’m not doing right and my weight is going back up. It’s not the jeans getting small so I have to look at what I’m eating” (Reyes et al., 2012). This is a clear example of the component of Kanfer’s model (Kanfer & Gaelick, 1975) of self-regulation in which negative feedback from self-monitoring an outcome leads to an evaluation of the way in which behaviour affects health.

Trust and deception

Sitting alongside emotions, analysis and adherence were the interlinked concepts of trust, honesty, and deception. When it came to monitoring outcomes in particular, participants seemed to make deliberate choices about what measures to use. These decisions appeared to revolve around trust in the measure, but there was variation amongst participants in terms of what was considered trustworthy (Bennett & Gough, 2013; Byrne et al., 2003; Jaksa, 2011; Witwer, 2014). For example, a weight loss maintainer explained: “I have to weigh myself at least every other day...cause if I don’t... I can feel that I’m maybe gaining a little weight but sometimes I can talk myself outta that, but the scale doesn’t...lie” (Witwer, 2014). In contrast, other studies included participants who rejected scale weight measures, often citing their inability to disentangle fat and muscle mass from a simple measurement of total body

mass. In a study of men, the scale was labelled a “lying bitch” by one participant due to its inability to distinguish between body fat and muscle (Bennett & Gough, 2013).

As well as trust in outcome data, trust in behavioural measures could also vary due to self-deception in an effort to avoid anticipated shame. In an Interpretative Phenomenological Analysis of repeated diet failure, a participant explained of her food diary, “I’d be, I’d feel brave to write it down, but ashamed at the same time... I have started to write it down, in fact I’d probably completed a whole day, but I’ve conveniently left things out ... so it isn’t written on the paper... You know you’ve had a—I’m exaggerating, but you’ve had a cream cake, you know, and you’ve forgot to put it down—and I’ve conveniently forgot to do it—so it isn’t—you’re not being honest with yourself” (Green et al., 2009). This contrasted with another study, in which successful maintainers discussed how monitoring kept them “honest”, but did not describe the mechanism through which this was achieved (McKee et al., 2013). The interplay between deception and honesty ties in with the above descriptions of participants avoiding self-weighing in instances where they anticipated negative feedback (e.g. weight gain). Their accounts suggest that, though they knew they had gained weight or were partaking in behaviours which may lead to weight gain, they avoided self-weighing and, consequently, avoided definitive evidence of this fact.

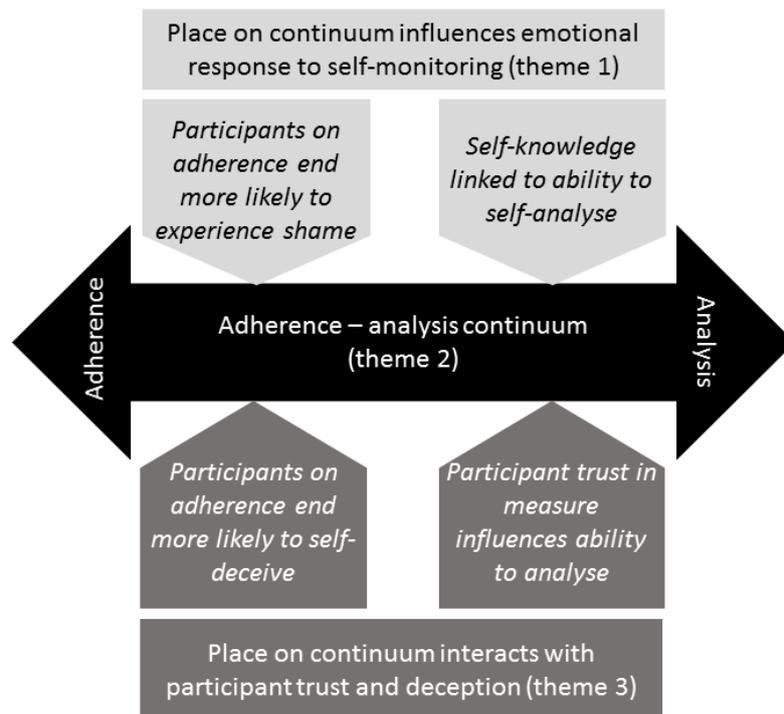
Discussion

Integrated model

This synthesis provides new insights into the implications of self-monitoring on weight loss and maintenance. It suggests that self-monitoring can range from an aid to increase adherence to behaviour change targets, to a tool for facilitating analysis and self-experimentation. This is particularly apparent in ‘attentive and reactive self-monitoring’ but is also linked with the other two themes. In Figure 2 we present an integrated model demonstrating the links

between the analytic themes, which aims to visually represent the ways in which adherence and analysis are connected. An individual's ability to analyse is directly related to their understanding of, and trust in, the parameter(s) they are measuring; for some participants the quantitative measurements appear preferable, whereas others opt for more subjective measures. This continuum can also explain differing emotional reactions to self-monitoring, which may elucidate why some participants stop self-monitoring as weight regain commences, and others are able to use it as an effective tool to curb weight regain.

Figure 2 illustration of interlinkages between analytical themes



One explanation for the impact of the adherence-analysis continuum on the experience of self-monitoring can be derived by viewing it through the lens of a Foucauldian framework of a neo-liberal society. From a Foucauldian perspective, self-knowledge and personal responsibility are at the core of the concept of a responsible citizen; by taking responsibility for one's own health and wellbeing, the individual diminishes their burden on society. A

slim, toned, fit body is usually associated with health and people with such bodies are seen as ‘successful citizens who exercise responsible consumer choices, in keeping with societal values of autonomy, individualism, and self-control’ (MacKenzie, 2010, p.17). There is a great deal of shame and stigma associated with the failure to maintain or regain such a body (Dickens, Thomas, King, Lewis & Holland, 2011). As authors we are in no way endorsing this viewpoint, but rather drawing on it as it provides a potential explanation for the emotional reaction to self-monitoring illuminated by this review. In this context, if people internalise these neo-liberal ideals, monitoring conducted during the ‘adherence’ end of the continuum means unfavourable results/readings are interpreted as a failure which takes on a moral valence (Foucault, Martin, Gutman, & Hutton, 1988; Lupton, 2013; Lupton, 2016). In turn, this moral judgement invariably affects their views of themselves, their bodies and their weight status. Indeed, in all cases in this review where monitoring was conducted to enhance adherence, undesired results/readings were consistently interpreted in an emotionally negative way that did not engender change, often discouraging continued efforts. In contrast, when self-monitoring was used to facilitate analysis and action, overtly negative reactions did not emerge. This illuminates how, in the context of self-analysis, negative feedback (e.g. weight gain) can play a different role than in adherence models – it serves as data with which to facilitate an individual’s quest for self-knowledge, rather than only as a reflection of the individual’s personal failing. As self-knowledge is a core component of the ethical individual in modern neo-liberal paradigms, and in light of societal structures that privilege knowledge viewed as scientific, the weight reading, though undesirable, is not inherently linked with morality, and therefore is not inherently linked with shame (Foucault et al., 1988; Lupton, 2016).

Existing literature on the role of self-monitoring in self-directed behaviour change attempts is sparse. Self-regulation and other behaviour change theories as they relate to self-monitoring

and weight change are most commonly studied and described within the context of formal interventions (Madigan et al., 2015; Pacanowski, Bertz, & Levitsky, 2014). The most relevant work on self-monitoring in a self-directed context emerges from studies of the quantified self movement, and Deborah Lupton's work on this, particularly on discourses involving the 'good citizen', have aided interpretation of findings from this review (Lupton, 2013; Lupton, 2016).

Though self-monitoring of weight has been found to be associated with successful weight loss and weight loss maintenance, the mechanism behind this association remains unclear (Butryn et al., 2007; Linde, Jeffery, French, Pronk, & Boyle, 2005). Findings from this review may shed some light on why self-monitoring may facilitate weight management in some individuals and not in others (Madigan, Aveyard, et al., 2014; Madigan et al., 2015; Madigan, Jolly, Lewis, Aveyard, & Daley, 2014). A possible reason for this variation is the way in which the individuals react, interpret and act on the data. Some negative feedback is probably inevitable in any sustained weight loss attempt, and accounts from this review suggest that when such feedback is viewed as data to aid analysis, rather than as a moral judgement of personal failing, self-monitoring efforts are more likely to continue and be successful. This use of self-monitored information is associated with Lupton's work on the quantified self-movement (Lupton, 2016). Lupton's quantified self refers to the use of technology to track inputs (e.g. food consumption), outputs (exercise, calories burned) and states (mood, etc.). The overarching notion of the quantified self is that the body has the potential for improvement and self-tracking is a benign behaviour enacted by 'good' citizens. Digital records of self-tracking can be shared with others, thus making the process of self-analysis a public affair. How this public enactment fits with, or is experienced by, those who (through the Foucauldian lens discussed earlier) have 'failed' in their pursuit of the societal ideal of the slim, toned, fit, healthy body requires further analysis and is beyond the scope of

the current review. The use of self-monitored information is also closely linked to the behaviour change technique known as behavioural experimentation, and is reflected in self-regulation theory (Kanfer & Gaelick, 1975; Susan Michie et al., 2013).

Strengths and limitations

To the best of our knowledge, this review is the first of its kind to systematically review the literature on self-monitoring in the context of self-management. This is both a strength – in that it begins to explore a previously under examined area – and a limitation, in that we are unable to directly compare our findings with those from other reviews. Previous explorations of self-monitoring have either focussed on its association with quantitative outcomes, or, where qualitative methods are used to explore self-monitoring, the context is that of formal interventions or as part of researcher-led clinical trials (see above). In these cases, the experience of self-monitoring may be distinctly different, since it is likely to have been stimulated by a third party and may form a core element of a structured programme.

However, far more people attempt to manage their weight outside such programmes and this paper explores self-monitoring of weight and related behaviours in this self-initiated mode which has received little prior research attention. By considering these experiences of self-monitoring, we can put the existing data from structured programmes into a broader context. However, further research is needed to better judge whether the experiences described here are broadly representative.

Methodologically, this paper presents a detailed and in-depth synthesis of findings across a range of study designs and settings. Study selection was not limited to papers that focussed exclusively on self-monitoring, allowing us to utilise a broad range of rich data in our analysis. Finally, using a mix of inductive and deductive approaches allowed new themes to emerge from the data, whilst analysis was strengthened by drawing on relevant existing theory. However, we acknowledge that our existing knowledge of the literature in this area

may have clouded the inductive lens adopted. To attempt to minimise the impact of this, we included an experienced qualitative researcher who does not work primarily in the obesity field and the study team discussed the merits of the findings as they emerged and ensured they were grounded in the original findings (e.g. by being supported by verbatim quotations from the primary studies).

As with any review, the strengths of our findings are also tempered by the scope and quality of the included studies. Unfortunately, many study reports lacked sufficient information to judge the quality of some aspects of the research (see table S2). Several of the studies had potential issues with recruitment methods and were undertaken in homogenous populations. In most cases it was unclear whether the interviews fully covered all aspects of participants' experiences of self-monitoring, so it is difficult to determine if the content of the studies accurately reflect the experiences of the participants, or if the studies' results are biased towards the interests of the researchers. Many studies did not contain an adequate level of reflexivity, particularly in relation to the role of the researcher, raising questions about the veracity of the published findings. We have endeavoured to minimise this by drawing primarily on verbatim quotes from participants, but we acknowledge that this thematic synthesis allows only for the examination of published findings (authors' interpretations and selected verbatim quotations by participants). However, the themes reported here emerged from or were found in a range of studies, which strengthens the case for our findings.

Future directions

In light of this synthesis, we suggest a number of future directions for research. Firstly, studies of self-monitoring in self-directed weight loss need to include a diverse range of populations. Secondly, data from this review suggest there is not a one-size-fits-all approach to the tools and modes used for self-monitoring for weight loss; future studies testing interventions which include self-monitoring could, where possible, consider offering

participants a choice of monitoring tools or could actively seek to enhance participant trust in the measure before asking participants to commence use. Thirdly, future investigations could usefully draw out more explicitly the thoughts that people have and the emotions generated by self-monitoring and how these two inter-relate. This would help validate our model, which we have inferred from the data presented.

In conclusion, our findings suggest that experiences of self-monitoring are inherently related to the broader emotional, societal and political framework in which self-monitoring is enacted. Accounts from this review suggest that framing self-monitoring as a tool to aid analysis may help mitigate the phenomenon of shame leading to abandonment of self-monitoring. As such, findings suggest that interventions could benefit from explicitly encouraging participants who self-monitor to view the process as a way to facilitate self-analysis, rather than purely as a means to ensure adherence, and from considering the way in which instructions to self-monitor may, advertently or inadvertently, interact with broader discourses about obesity, citizenship, and personal responsibility.

Declarations of Conflicting Interests

The Authors declare that there is no conflict of interest.

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