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Abstract: Engagement denotes the extent to which, and how, individuals participate in weight management (WM) services. Effective WM services should generate meaningful outcomes and promote high participant engagement; however, research is predominantly focused on the former. Given that engagement is a poorly understood phenomenon, and that engagement-related concepts are often used synonymously (e.g., dropout and attrition), the engagement pathway is hereby introduced. This pathway defines key concepts (e.g., recruitment, adherence, attrition) and their relationships in the enrolment, intervention, and maintenance stages of treatment. The pathway will help researchers and practitioners better understand engagement-related concepts whilst encouraging greater conceptual consistency between studies.

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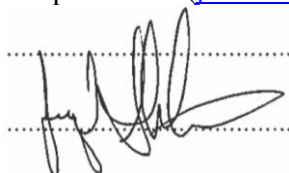
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Research Highlights – The Engagement Pathway

- Engagement denotes the extent to which, and how, people participate in a service
- Our understanding of engagement is greatly hampered due to inconsistent terminology
- We introduce The Engagement Pathway to define a host of engagement-related concepts
- We distinguish between terms such as ‘drop-out’, ‘non-completion’ and ‘attrition’
- Adoption of these defined concepts will advance our understanding of engagement

Dear Editors,

Please find hereby submitted a manuscript for publication in Obesity Research and Clinical Practice. We hope that this manuscript will be considered for publication as a Review Article.

Overview of the paper

This report sets out to provide a conceptual pathway for engagement in weight management services, albeit that the pathway can be translated to a variety of health improvement and health psychology fields. Given that the efficacy of WM programmes is hinged on participant engagement (*i.e.*, the extent to which, and how, individuals participate in WM services), it is of utmost importance that the research- and practice- community understand this phenomenon. Current research is severely limited due to the inconsistent definitions and criterion used to classify engagement-related terms (*e.g.*, dropout, attrition, completion, retention), and generalisations and between study comparisons are challenging to ascertain. This paper therefore introduces the engagement pathway. The pathway includes a range of concepts (*e.g.*, initiation, dropout, completion), their definitions, and information highlighting the relationships between these concepts. This offers a means of standardising and advancing engagement-related research and terminology – thus aligning with the journal’s mission in advancing evidence-based practice. The pathway should be utilised by researchers and practitioners in the design and planning of WM services, and strategies to enhance engagement can be mapped against the pathway. Increasing the engagement in WM services, and health services more broadly, would greatly enhance their efficacy.

Each of the authors are experts in the field of weight management engagement, with this pathway and the associated information being the product of extensive discussion and knowledge transactions between the included persons.

Declarations

We have read and have abided by the statement of ethical standards for manuscripts submitted to the Obesity Research & Clinical Practice.

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We confirm that this manuscript, and the data within, has not been submitted or published elsewhere and that the content of the manuscript is original.

All authors have seen and approved the final manuscript.

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1 **Title:** The Engagement Pathway: A Conceptual Framework of Engagement-Related
2 Terms in Weight Management

3

4 **Abstract**

5 Engagement denotes the extent to which, and how, individuals participate in weight
6 management (WM) services. Effective WM services should generate meaningful
7 outcomes *and* promote high participant engagement; however, research is
8 predominantly focused on the former. Given that engagement is a poorly understood
9 phenomenon, and that engagement-related concepts are often used synonymously
10 (e.g., dropout and attrition), the engagement pathway is hereby introduced. This
11 pathway defines key concepts (e.g., recruitment, adherence, attrition) and their
12 relationships in the enrolment, intervention, and maintenance stages of treatment.
13 The pathway will help researchers and practitioners better understand engagement-
14 related concepts whilst encouraging greater conceptual consistency between
15 studies.

16

17 **Keywords:** Engagement, Attrition, Dropout, Adherence, Weight Management.

18 **1. Introduction**

19 Engagement is a complex and multifactorial phenomenon that is essential to the
20 effectiveness of health services (Coday et al., 2005; Gitlin & Czaja, 2015; Schwartz
21 & Axelrad, 2015). Health services must be designed to promote clinically significant
22 health improvements *and* facilitate engagement (Burgess et al., 2017; Oude
23 Luttikhuis et al., 2009; Wright & Wales, 2016). Engagement denotes the extent to
24 which, and how, individuals participate in an intervention or service (Nobles et al.,
25 2016). In this respect, the term *engagement* encompasses a range of concepts in
26 the delivery of health services, including treatment initiation, dropout, attrition,
27 retention, and adherence (Nobles et al., 2016). Whilst the outcomes of interventions
28 are dependent on the engagement of individuals (*i.e.*, patients, families, participants)
29 and health care professionals, engagement – and the associated concepts – are
30 poorly understood. This conceptual paper is written from the viewpoint of weight
31 management (WM) programmes or services (WM services used hereafter), but
32 many concepts could be translated to health improvement services more broadly
33 (*e.g.*, smoking cessation, cardiac rehabilitation, and physical activity) (Abshire et al.,
34 2017; Coday et al., 2005; Gitlin & Czaja, 2015; Karlson & Rapoff, 2008).

35 Engagement is important from multiple perspectives. For individuals with obesity,
36 higher WM service attendance is associated with more favourable weight
37 management (Germann et al., 2006; Miller & Brennan, 2015; Nobles et al., 2016).
38 Further, dropping out of a WM service could denote a failed weight loss attempt,
39 which may be linked to feelings of frustration, discouragement, and learned
40 helplessness. For researchers, attrition affects the internal- and external- validity of
41 study findings (Coday et al., 2005; Karlson & Rapoff, 2008; Miller & Brennan, 2015),
42 whilst for practitioners, **participant** engagement affects cost-effectiveness **of service**

43 **delivery**, the time required for recruitment, and the accurate representation of service
44 impact (e.g., scale-up, reach, and dissemination) (Kelleher et al., 2016; Miller &
45 Brennan, 2015). With that in mind, expert 'recruitment and retention' groups have
46 been formed to counter the troublesome burden of low participant engagement in
47 health services and research - e.g., NIH Behaviour Change Consortium (Coday et
48 al., 2005).

49 In general, research investigating engagement in WM services can be grouped into
50 three categories, including predictors of engagement, reasons for engagement, and
51 strategies to enhance engagement (Dhaliwal et al., 2014; Kelleher et al., 2016;
52 Schoeppe et al., 2014; Skelton & Beech, 2010). Evidence reviews have synthesised
53 these three fields of research (Burgess et al., 2017; Dhaliwal et al., 2014; Kelleher et
54 al., 2016; Moroshko et al., 2011; Skelton & Beech, 2010), but conclusions are limited
55 due to inconsistent terminology and criteria for engagement-related terminology. In a
56 recent call to action, Miller and Brennan (2015) identified 27 obesity intervention
57 studies and found no consistent operational definitions and/or criterion for attrition
58 and program completion. This issue is further complicated due to overlap and close
59 relationships between engagement-related terms, which often lead to terms (e.g.,
60 attrition and dropout, completion and retention) being used interchangeably when
61 often they refer to interrelated, but separate, issues.

62 Such methodological challenges also create difficulties when trying to determine WM
63 service effectiveness. Exemplifying this point, Nobles et al., (2017) undertook a
64 sensitivity analysis to evaluate how different completion criteria influences the
65 interpretation of outcomes in a pediatric WM service. In the first example, when
66 completion was defined as attending the last programme session (Jelalian et al.,
67 2008), 50.5% of participants completed the service with a mean reduction of 0.14

68 units in standardised body mass index (BMI). The second example applied a more
69 stringent criterion – attending all programme sessions (Herbert et al., 2015) – 11.1%
70 of participants completed the programme with a mean standardised BMI reduction of
71 0.20 units. Given that these two programme outcomes are proxy measures of WM
72 service effectiveness (NICE, 2013, NICE, 2014), the impact of adopting one criterion
73 over another is highly relevant. Spence et al., (2016), de Niet et al., (2011) and
74 Dolinsky et al., (2012) also provide similar empirical examples for how different
75 classifications of dropout affect the respective predictors. Therefore, to advance
76 research, understanding and practice in this area, it is imperative to identify and
77 define engagement-related concepts and their relationships.

78 The purpose of our paper is to propose a conceptual framework for engagement,
79 one that highlights key concepts and their relationships in a processual manner,
80 defined collectively as the engagement pathway. In doing so, we hope to encourage
81 greater consistency and specificity regarding engagement-related concepts,
82 outcomes that are relevant to both research and health service delivery.

83

84 **2. The Engagement Pathway**

85 The engagement pathway (Figure 1) highlights key concepts related to three stages
86 of a WM service (enrolment, intervention, and maintenance/follow up stages) and
87 their relationships. The stages and concepts described herein can apply to both
88 pediatric and adult obesity, with particular attention to WM services that emphasize
89 lifestyle and behavioural changes for managing obesity. Key concepts include:
90 recruitment, (non-) initiation, attendance, adherence, completion, retention, dropout,
91 and attrition, all of which are operational at different stages along the pathway.

92 Individuals are likely to move through this pathway in various ways, dependent on
93 the decisions made regarding their engagement. Although many of the processes
94 within this pathway will be influenced by automated, sub-conscious decision making
95 of the participating individual or family, WM service engagement is an intentional
96 behaviour largely driven by conscious, reflective decision making (Ball et al., 2012;
97 Kelleher et al., 2016; Perez & Ball, 2017). Multiple re-engagement routes exist within
98 the pathway to emphasise that individuals may re-engage in a service at different
99 points in time (e.g., after deciding not to initiate or dropping out of treatment).

100

101

[INSERT FIGURE 1]

102

103 **2.1 Enrolment**

104 The enrolment stage includes recruitment, the decision to initiate treatment, and the
105 outcome of this decision (initiation or non-initiation). *Recruitment* refers to the
106 methods used to reach and inform individuals about available WM services, which
107 are often classified as active (potential participants are targeted specifically) and
108 passive methods (individuals identify themselves as potential participants) (Cui et al.,
109 2015; Fleming et al., 2015; Raynor et al., 2009). Whilst the effectiveness of active
110 and passive methods is inconsistent (Cui et al., 2015; Raynor et al., 2009), the
111 recruitment literature suggests that combined approaches may generate the greatest
112 yield in terms of inquiries and enrolments (Gupta et al., 2015). Where passive
113 methods can reach large numbers of eligible individuals with little resource required,
114 active methods can target and motivate prospective participants with greatest
115 potential to benefit from care. It is important that such blended recruitment

116 approaches are adaptive (*i.e.*, responsive to change), collaborative (*i.e.*, utilise a
117 body of expertise across disciplines), and dynamic (*i.e.*, evolve over time) to optimise
118 engagement outcomes (Gupta et al., 2015).

119 After being informed of, or referred to, WM services, potential participants decide
120 whether or not to initiate the treatment intervention. This decision may be based on
121 several factors including awareness of a health problem, perceived control over
122 internal- and external- enrolment barriers, and efficacy attributed to the service
123 (Perez et al., 2015). However, it is important to differentiate *intenders* (those who
124 formed the intention to initiate treatment) from *initiators* (those who were able to act
125 upon their intention to commence treatment) since some *intenders* may not actually
126 enrol in treatment due to internal- (*e.g.*, experiencing a health problem) and external-
127 barriers (*e.g.*, not able to afford transportation costs). Research has found that a
128 sizable proportion of intenders do not initiate their respective WM service (Nguyen et
129 al., 2012; Nobles et al., 2016). Consequently, strategies to enhance treatment
130 initiation should be tailored to individuals' level of readiness for treatment (Ball et al.,
131 2017; Geller et al., 2015). Exploring potential barriers and providing support
132 accordingly may be an effective strategy for those who have formed the intention to
133 initiate treatment (Perez et al., 2015), and theoretically informed tools such as the
134 Readiness and Motivation Interview (Ball et al., 2017) could help assess readiness
135 for treatment.

136 With respect to enrolment, two other points merit discussion. First, practitioners may
137 deem prospective participants ineligible for WM if they do not satisfy an entry
138 criterion (*e.g.* objective presence of an obesity-related co-morbidity) – thus
139 functioning as *de facto* gatekeepers influencing and/or controlling the enrolment
140 decisions of individuals and families. The dimension of the service provider(s) should

141 thus be acknowledged in the enrolment stage. Second, in the context of randomised
142 controlled trials, participants could be assigned to a control group or wait-list group.
143 Dependent upon the trial design and type of control, participants may receive a
144 variant type of intervention (whereby all engagement concepts would be operational)
145 or receive no intervention (only some engagement concepts would be operational).
146 For individuals assigned to a wait-list group, the point of intervention initiation may be
147 off-set or delayed by a pre-defined time period. The transparent reporting of control
148 group engagement is as important therefore as that of the active intervention group.

149

150 **2.2 Intervention**

151 Individuals who initiate WM services are viewed to be within the intervention stage of
152 treatment. *Attendance* and *adherence* are two prominent, interconnected factors
153 associated with this stage. Attendance refers to individual's presence in a WM
154 session, making it an easily obtainable and quantifiable measure of engagement
155 (Nobles et al., 2017). Attendance enables engagement patterns to be examined and
156 for additional engagement-related criteria to be formed (e.g., completion and
157 dropout) (Nobles et al., 2016). On the other hand, adherence has multiple
158 dimensions (e.g., when, how, with respect to what) and is generally defined as the
159 extent to which individuals follow treatment recommendations (Burgess et al., 2017).
160 Whilst attendance is sometimes used as a proxy measure of adherence, attendance
161 and adherence are not mutually exclusive. Adherence can encompass both
162 adherence to treatment sessions (*sessional* adherence) and adherence to treatment
163 recommendations (*treatment* adherence). Also, health care providers' adherence to
164 delivery protocols and guidelines can influence treatment outcomes (*delivery*
165 adherence, also known as fidelity). Treatment adherence is included within Figure 1,

166 and as shown, individuals may exhibit different patterns of attendance in, and
167 adherence to, a WM service.

168 Many individuals will prematurely leave WM services (*i.e.*, dropout of treatment)
169 (Dhaliwal et al., 2014; Skelton & Beech, 2010). *Dropping out* is the decision to
170 prematurely disengage from WM services (Kazdin et al., 1997; Skelton & Beech,
171 2010), which can happen at various time points throughout the service. Some
172 individuals may *re-engage* in the WM services, but to our knowledge, no empirical
173 reports have documented the re-engagement of individuals within treatment
174 services. If individuals permanently dropout (*i.e.*, do not re-engage), this leads to
175 *attrition*. Accordingly, attrition represents a reduction in group size and is the product
176 of dropout.

177 *Completion* is an operational definition characterised by the fulfilment of a predefined
178 criterion, ideally driven by empirical data or guided by professional
179 experience/expertise. This criterion can be established relative to an attendance
180 threshold (*e.g.*, attend $\geq 70\%$ WM sessions); individuals satisfying this criterion are
181 usually classified as completers. On the contrary, *retention* refers to the keeping of
182 individuals in a WM service (Gitlin & Czaja, 2015). Thus, retained individuals may not
183 satisfy or exceed the required attendance threshold to complete the service, a
184 notable difference that is relevant conceptually and analytically.

185 There are numerous considerations associated with engagement in the intervention
186 stage. First, it is important to collect routine attendance data to determine the extent
187 of intervention attendance, which can be associated with intervention effectiveness
188 (*i.e.*, a dose-response). Second, given that the dose-response relationship also
189 depends on the level of treatment adherence, data on adherence (*e.g.*, goal tracking
190 and behavioural monitoring) should also be collected routinely. Third, there is a need

191 to understand *who* engages in a WM service, which relates to availability and
192 accessibility. Strategies can be developed and WM services refined if the intended
193 audience is not engaged, which can mitigate the widening of health inequalities.
194 Last, where strategies are being utilised to encourage engagement, rigorous
195 evaluation and reporting are needed to establish effectiveness. Most engagement
196 strategies are not evaluated (Cui et al., 2015; Schoeppe et al., 2014), possibly
197 because engagement is often viewed as a secondary or tertiary outcome and, as
198 such, does not receive as much attention or interest.

199

200 ***2.3 Maintenance/Follow-up***

201 The maintenance stage is reliant on the WM service design. Some WM services
202 include a maintenance intervention whilst others do not (Altman & Wilfley, 2014;
203 Oude Luttikhuis et al., 2009). In line with the type of maintenance intervention
204 available, many of the aforementioned terms remain operational. For example, if a
205 maintenance intervention requires in-person session attendance, then attendance,
206 adherence, retention, completion, dropout and attrition should be reported during this
207 period in the same manner as in the intervention stage. Treatment adherence may
208 become more pertinent in the maintenance stage, with WM services designed to
209 instil sustainable health behaviours amongst individuals (Altman & Wilfley, 2014).
210 Correspondingly, maintenance interventions typically shift the attribution of outcomes
211 from WM services to individuals, with self-management of obesity being the
212 promoted strategy. Whilst some individuals may decide to re-commence the
213 treatment service, others will permanently leave the service at this point.

214

215 **3. Applying the Pathway**

216 The purpose of the pathway is to exemplify the range of engagement-related terms
217 that are operational within a WM service. The pathway defines each of the concepts,
218 highlights the nuances, and documents the interconnections between concepts and
219 stages. The pathway could be used to identify time points in the WM service (e.g.,
220 recruitment, initiation, early intervention) that may benefit from engagement-
221 promoting strategies. Where evidence is available, research has suggested that
222 orientation sessions (Germann et al., 2006), a supplementary short messaging
223 service (de Niet et al., 2012), and motivational interviewing (Bean et al., 2014) can
224 enhance initiation and reduce dropout. Data are required to determine the
225 effectiveness of engagement strategies specific to time points within the engagement
226 pathway. In order to move towards standardised reporting of engagement,
227 systematic data collection is needed. The collection of session-by-session
228 attendance data – within the intervention and maintenance stages – is an important
229 and feasible first step.

230

231 **4. Conclusion**

232 Engagement is a key factor that mediates intervention effectiveness. Although
233 research in the field of engagement is growing, non-standardised terminology
234 creates ambiguity when comparing studies and making generalisations that are
235 meaningful and appropriate (Dhaliwal et al., 2014; Miller & Brennan, 2015; Moroshko
236 et al., 2011). The engagement pathway offers a means of standardising and
237 advancing engagement-related research and terminology, which can enhance
238 understanding and measurement of the phenomenon. The engagement pathway

239 should be considered within the design and planning stages of WM services, and
240 provisional strategies can be mapped against the pathway to document the
241 approaches used to optimize engagement. We hope that the pathway, and the
242 associated lexicon, will assist those working in the field of WM and health
243 improvement services research by adding clarity and specificity in academic- and
244 health service- settings.

245 **List of Abbreviations:**

246 CONSORT: Consolidated Standards of Reporting Trails

247 DH: Department of Health (UK)

248 NICE: National Institute for Health and Care Excellence (UK)

249 NIH: National Institutes of Health (USA)

250 WM: Weight Management

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371 **Figure Captions**

372

373 **Figure 1: The Engagement Pathway**

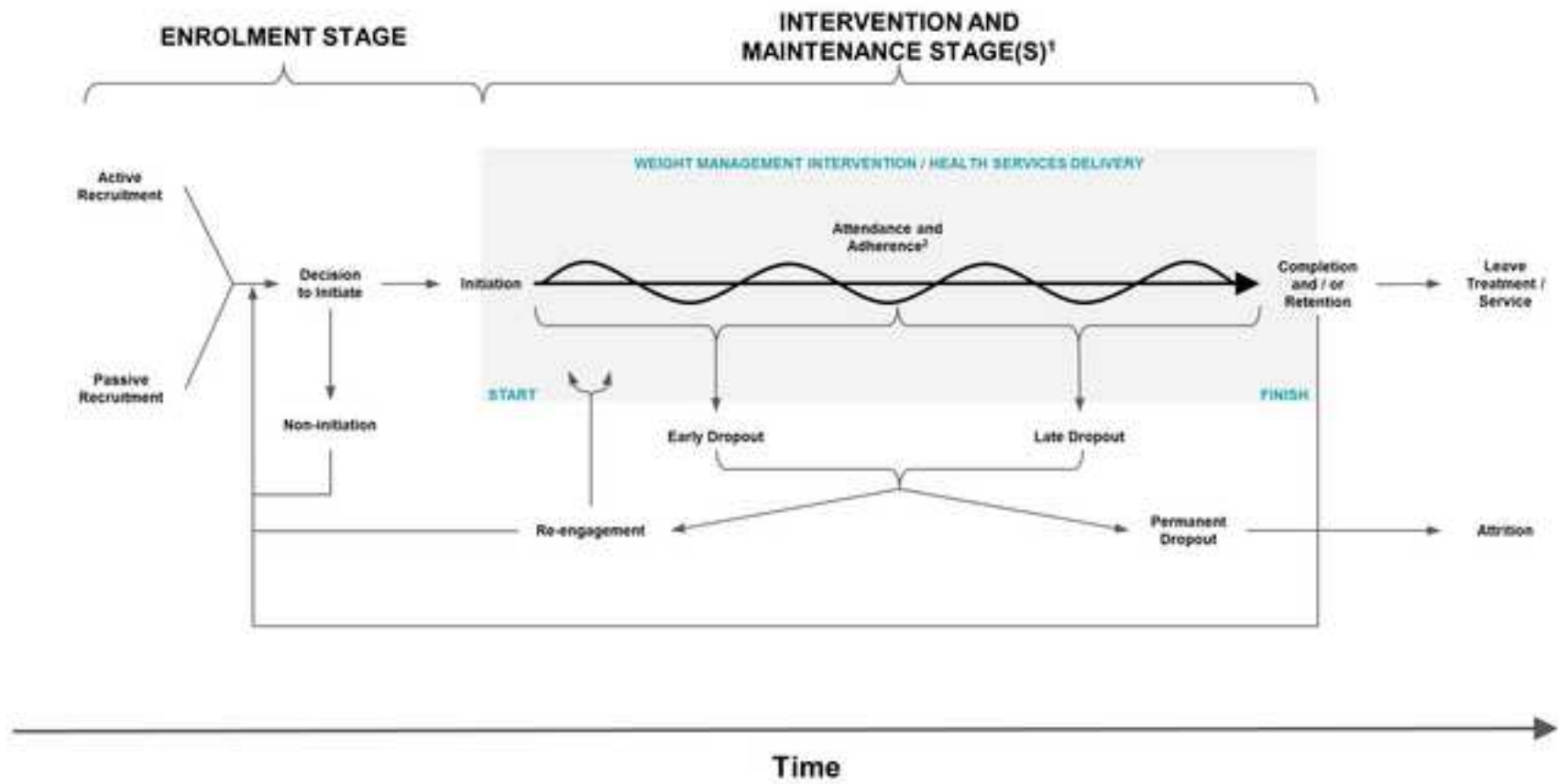
374 ¹Treatment may include a maintenance intervention

375 ²Solid line = consistent attendance and adherence; wavy line = inconsistent

376 attendance and adherence

Figure

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***Statement of Conflicts of Interest**

Conflicts of Interest: None

***Detailed Response to Reviewers**

REVIEWER COMMENT	RESPONSE
<p>Reviewer 1</p>	
<p>1. I do agree with the first reviewer that the title needs editing. A conceptual pathway for engagement makes it seem like you are providing a course of action, when in reality you are defining various stages for potential engagement. I would revisit the title to tie it in better with the paper.</p>	<p>Many thanks for taking the time to read this article and propose these suggestions.</p> <p>We have now amended the title to one which we think is a better reflection of the article content.</p> <p>Revised title: The Engagement Pathway: A Conceptual Framework of Engagement-Related Terms in Weight Management.</p>
<p>2. In the Introduction you say "engagement affects cost-effectiveness," please clarify with regards to what?</p>	<p>We have amended this to specify that:</p> <p>"participant engagement affects cost-effectiveness of service delivery" (line 41, pg. 2).</p>
<p>3. You state the difference between passive and active methods, suggesting the need to combine both techniques, however, might these also provide a difference in engagement response-touching on this matter may be interesting to the reader and tie more closely with your concept of engagement.</p>	<p>This is a very good point, and due to the limited and inconsistent evidence available, we chose not to include data or conclusive remarks on the effectiveness of different recruitment strategies. Indeed, there are data to suggest that individuals who self-refer (i.e. passively recruited) are likely to have higher attendance (perhaps due to greater intrinsic motivation), these findings are not conclusive. The opportunity to self-refer is also context specific; any clinically-based WM programmes would not allow a patient to self-refer. Similarly, passive recruitment strategies have been shown to be both more- and less- cost-effective in contrast to active recruitment modalities.</p> <p>Our intention of this paragraph was to inform the reader of different recruitment strategies, and also highlight that a blended approach should be considered – recruiting those who would benefit greatly from treatment (likely via active recruitment) and those who may have high intrinsic motivation (often via passive recruitment).</p>
<p>4. This section also mentions at the end "and dynamic (i.e., evolve over time) to optimise outcomes (Gupta et al., 2015)." Might you be more specific in terms of identifying what outcomes, weight maintenance?</p>	<p>We have amended the final sentence to state:</p> <p>"It is important that such blended recruitment approaches are adaptive (i.e.,</p>

	<p>responsive to change), collaborative (<i>i.e.</i>, utilise a body of expertise across disciplines), and dynamic (<i>i.e.</i>, evolve over time) to optimise engagement outcomes (Gupta et al., 2015).” (line 115, pg. 6).</p>
<p>5. It seems in your discussion regarding individual's level of readiness for treatment you are suggesting whether or not they have formed the intent to initiate, may you bring in a theoretical model to assess such initiation, an e.g. may be the transtheoretical model, but perhaps you can suggest a more appropriate one.</p>	<p>We have amended this paragraph to provide two examples, one example which states how the readiness for treatment can be assessed and a second example which highlights that the perceived barriers to treatment should be explored (among those with the intention to initiate). The final two sentences of this paragraph now read:</p> <p>“Consequently, strategies to enhance treatment initiation should be tailored to individuals' level of readiness for treatment (Ball et al., 2017; Geller et al., 2015). Exploring potential barriers and providing support accordingly may be an effective strategy for those who have formed the intention to initiate treatment (Perez et al., 2015), and theoretically informed tools such as the Readiness and Motivation Interview (Ball et al., 2017) could help assess readiness for treatment.”</p>