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Assessing treatment motivation among patients receiving antiretroviral therapy: A multidimensional approach

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Abstract

Using multidimensional scaling analysis (MDS), this study examined how patient conceptualisations of treatment motivation compare with theoretically-based assumptions used in current assessment approaches. Patients undergoing antiretroviral therapy for HIV/AIDS ($n = 39$) rated for similarity all possible pairings of 23 treatment descriptions, including descriptors of intrinsic, extrinsic, approach, and avoidance motivation. MDS analyses revealed that patient perceptions of intrinsic and extrinsic motivation often differ from those based on definitions derived from common interpretations of self-determination theory. Findings also showed that patients reported motivation for avoiding treatment when they associated their medication regimens with side effects and other negatively-valenced outcomes. The study describes new applications of MDS in assessing how patients perceive the relationship between treatment behaviours and specific forms of motivation, such as intrinsic and extrinsic motivation. In addition, the study suggests how MDS may be used to develop behavioural strategies aimed at helping patients follow their regimens consistently by identifying treatment conceptualisations and contexts that facilitate or impede adherence.

Keywords

HIV/AIDS; antiretroviral; adherence; motivation; psychometrics/statistics & numerical data

Introduction

Motivation has long been viewed as a critical factor in predicting treatment outcomes among patients undergoing antiretroviral therapy (ART; Graney, Bunting, & Russell, 2003; Kalichman et al., 2001; Södergård et al., 2006). ART patients often must tolerate side effects and meet adherence levels of 95% or greater to achieve virological control and improve immune functioning (Chesney, Farmer, Leandre, Malow, & Starace, 2003; Bartlett, 2002). Estimates indicate that approximately 50% of patients fail to consistently meet these high standards (de Bruin et al., 2010). Interventions to promote adherence have focused on

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strengthening treatment motivation (e.g., Holstad, Dilorio, & Magowe, 2006; Parsons, Golub, Rosof, & Holder, 2007; Simoni, Frick, Pantalone, & Turner, 2003). Despite its prominent role in treatment, research and clinical practice suggests that our current approaches of conceptualizing and measuring motivation have not fully captured the multidimensional nature of this construct (Berg, Evangelista, Carruthers, & Dunbar-Jacob, 2006). There is a need to better understand the dynamic interplay between various forms of motivation and how patients perceive them in terms of treatment.

How might we explain our difficulties in assessing patient treatment motivation? Several factors may be at play, including the limitations of self-report measures used to assess motivation. While motivational self-report measures have much value, they also have shortcomings. One shortcoming involves social desirability response bias, the tendency for participants to present a favorable image of themselves on questionnaires (e.g., Del Boca & Noll, 2000; Rand, 2000). In the realm of treatment motivation research, this form of bias may prompt respondents to exaggerate their readiness for treatment or engagement with the treatment process.

Current self-report measures of treatment motivation are also limited in that these instruments often assess motivation to “approach” or engage with a given health goal while ignoring the effect of competing goals, roles, relationships, and the motivation for avoidance behaviour (Berg et al., 2006; Penedo et al., 2003). People often simultaneously experience motivation to both approach and avoid a particular behaviour. Sometimes avoidance motivation can facilitate adherence or other health-related behaviours. For example, the desire to avoid a drop in one’s T cell counts could lead to more consistent antiretroviral medication adherence. On the other hand, the desire to avoid acknowledging that one has a chronic illness or avoid medication side effects could result in patterns of denial and disengagement that appear in the form of treatment lapses. Furthermore, treatment cognitions that motivate some patients to approach or become more engaged with their regimens may trigger avoidance behaviours in others.

Self-report measures of motivation are also limited in that they are unable to fully explore the idiosyncratic, or individual-specific variations in the way patients think about their treatment. For example, patients may have idiosyncratic conceptions of intrinsic and extrinsic motivation for HIV treatment. As detailed in *self-determination theory* (Deci & Ryan, 1985; Ryan & Deci, 2000), intrinsic and extrinsic motivation consist of the reasons or goals that serve as the impetus for pursuing a particular behaviour. Intrinsically-motivated behaviours are those that people engage in of their own volition and for an internal sense of satisfaction or reward. Extrinsically-motivated behaviours are performed because the individual is prompted by an external source, such as a doctor, family member, friend, significant other, or social norm. In collectivist or communal cultures, behaviours that appear to outside researchers as externally driven may be perceived by the individuals being assessed as intrinsically motivated (Iyengar & Lepper, 1999). Similarly, women’s socialization may lead them to view acting in relation to others’ needs rather than their own as intrinsically motivated (Weissman & Brown, 1996; Iyengar & Lepper, 1999). In both cases, self-report measures may be unable to detect these idiosyncratic variations among patients and whether specific treatment behaviours are perceived as either intrinsically or extrinsically motivated.

The distinction between intrinsic and extrinsic motivation is critical in adherence. Research has associated intrinsic motivation with more durable behavioural change, long-term engagement and favorable emotional functioning (Curry, Grothaus, & McBride, 1997; Lynam et al., 2009). Extrinsic motivation, on the other hand, is associated with the more rapid adoption of new behaviours, lower likelihood of long-term persistence, and higher

levels of negative affect (Baumann, Kaschel, & Kuhl, 2005; Bernard & Krupat, 1994; Curry, Grothaus & McBride, 1997; DeRidder, De Wit, & Adriaanse, 2009; Lynam et al., 2009).

We propose that the study of treatment adherence and treatment motivation would be enhanced by more fully taking into account idiosyncratic variations in the meanings that people attach to their treatment behaviours. For that reason, we used multidimensional scaling (MDS) to uncover idiosyncratic views of treatment behaviours held by patients undergoing antiretroviral therapy. Through MDS, we allowed patients to categorize their own treatment behaviours in terms of both approach and avoidance as well as intrinsic and extrinsic motivations. MDS analyses also allowed us to gauge the salience of these motivations for each participant, and the relation of treatment adherence levels to these conceptualisations.

Multidimensional scaling analysis

In multidimensional scaling, participants are presented with each possible pairing of a set of stimuli (e.g., treatment-related statements or behavioural descriptions) chosen to represent a theoretical domain of interest. Participants simply rate the similarity of each pair, which the statistical program uses to portray the participants' idiosyncratic conceptualisation of that domain. This approach allows participants' use of a dimension such as intrinsic versus extrinsic motivation to emerge from his overall set of judgements, rather than forcing the participant to directly rate a conceptual dimension via a face-valid question. These ratings produce a visual representation of the psychological structure that is implicit or "hidden" in a participant's psychological judgements (Kruskal & Wish, 1978; Rosenberg, 1977; Stalans, 1995). MDS also substantially lessens the effects of social desirability bias since the "distance" between any two stimulus items in the output takes into account the participants' entire pattern of responses, not simply one face valid rating.

We analysed the treatment-related conceptual "maps" of HIV-seropositive men who have sex with men (MSM) and were undergoing antiretroviral treatment. We examined stimuli that reflected both common treatment-related behaviours, and the conceptual dimensions of approach and avoidance and intrinsic and extrinsic motivations. Our first purpose was to describe the treatment motivations of these men, and the specific behaviours that reflected different motivations. Beyond this, we expected that men with higher versus lower adherence would show different conceptualisations of their treatment behaviours. Thus, we also analysed the data in terms of treatment adherence groups.

Method

Participants

Thirty-nine men undergoing antiretroviral therapy participated in the study. A targeted recruitment procedure ensured an even distribution of study participants based on adherence levels and duration in treatment. Specifically, we sought to recruit 40 participants with varying levels of adherence (i.e., 95% or greater vs. less than 95%) and treatment duration (i.e., more than two years vs. two years or less). Health providers and social workers at hospitals, clinics, and community health centres in the Chicago metropolitan area referred patients to the study. Participants had a mean age of 40 years ($SD = 8.9$). The mean length of time on treatment reported by participants was six years ($SD = 6.3$), with a range of two months to 20 years.

Measures

Demographics—Participants provided basic demographic data by completing a 12-item questionnaire designed to obtain information on age, ethnicity, education, employment, and income.

Adherence—Self-reported adherence was assessed with the AIDS Clinical Trials Group (ACTG) adherence questionnaire (Chesney et al., 2000). Participants were asked to indicate within a four-day period the number of doses missed for each medication prescribed, the number of days all doses were missed, and how closely the prescription was followed (i.e., according to schedule and special instructions). The total number of pills missed was subtracted from the number of pills prescribed during the four-day period to obtain an estimate of the number taken. This number was then converted into a percentage to obtain an adherence rate. Adherence rates of 95% and greater are believed to be optimal for virological control and immune functioning, thus we used the 95% threshold to define “optimal” adherence. Participants with adherence rates below 95% were considered to have sub-optimal adherence. Participants were also asked to provide information on their duration in treatment.

Stimulus items—The stimulus items consisted of 23 statements describing treatment behaviours and ways of perceiving treatment behaviours, which were derived during preliminary research from focus groups and pilot testing with men undergoing antiretroviral therapy. The stimuli and abbreviations used to identify them in Figures 1 through 3 are given in Table 1. Participants used a seven-point rating scale ranging from “not at all” (1) to “very” (7) to rate the similarity between all possible pairings of the 23 items. The 253 comparisons were presented in random order by a computer-based survey program; participants responded via the computer, in a private setting.

As Table 1 shows, 14 of the stimulus items consisted of basic descriptions of treatment behaviours (e.g., “opening a bottle of medicine,” “swallowing the medicine,” and “following doctor’s orders”). To assess the conceptual underpinnings of participants’ ratings, we included eight items representing conceptual markers for each of four dimensions. Thus, conceptual markers for intrinsic and extrinsic motivation were “Something I choose to do...” and “Something I do because it is required...” We also included markers for approach or avoidance motives (“...makes me want to stick with my HIV treatment plan” or “... makes me want to avoid my HIV treatment plan”), behaviours that were perceived as positively or negatively valenced, and those that were viewed as concrete or abstract. Finally, to determine how salient a given treatment conceptualisation was in the mind of a participant, we included a self-referent stimulus item (“...describes the way I usually think about my HIV treatment plan.”).

Procedure

Study sessions were conducted at a community-based health clinic in Chicago that provides services primarily to gay and bisexual patients. Participants completed study measures in a private room, subsequent to being administered informed consent. We informed participants that they would use a computer program to give their views of 23 HIV treatment-related behaviours and symptoms. Participants were informed that there were no “right” or “wrong” answers and that they should give their first impression, responding relatively quickly. After completing the study session, participants received a \$40 incentive. All procedures for recruitment, data collection, and confidentiality were reviewed and approved by the Institutional Review Boards of the University of Illinois at Chicago and Howard Brown Health Center.

Data analyses

Stimulus ratings were analysed using PROXSCAL, a multidimensional scaling program. MDS analyses were conducted for sample subgroups of patients with optimal adherence and those with suboptimal adherence. We created a triangular similarity matrix for each subgroup; data was treated as ordinal with the “untie tied observations” option chosen.

We used two goodness-of-fit measures to determine the number of dimensions that best fit each analysis: Stress-1 (i.e., Kruskal’s stress) and dispersion accounted for (DAF). Stress values range from 0 to 1, with smaller values (e.g., 0 to .15) suggesting a good fit (Stalans, 1995). Higher DAF values to a maximum of 1 indicate a better solution. The most parsimonious solution was selected based on the goodness-of-fit values and the overall interpretability of the solutions generated by PROXSCAL. Distances between items represented in MDS configurations were determined both through visual inspection and through calculations using the Euclidean distance formula.

Results

Adherence rates

Mean adherence for the sample was 78.5% (SD = 30.1). Fifty-one percent of participants (n = 20) were classified as having optimal adherence of 95% or greater. Their mean adherence level was 98.8% (SD = 5.6). The 49% (n = 19) of participants classified as having suboptimal adherence had mean adherence of 57.1% (SD = 30.6). Treatment duration in this sample was fairly evenly divided, with 54% of participants (n = 21) receiving antiretroviral therapy for more than two years while 46% (n = 18) had been in therapy for two years or less.

Multidimensional scaling solutions

We obtained MDS solutions in 1, 2, 3 and 4 dimensions for each adherence-level subgroup. The solutions for participants with optimal adherence ranged from Stress-1 = .17 and DAF = .97 for the one-dimensional solution, to Stress-1 = .08 and DAF = .99 for the four-dimensional solution. We rejected the one-dimensional solution because the stress level was greater than 0.15. The addition of a second dimension reduced stress substantially (by 24%), with further declines in the three or four dimension solutions. Based on the goodness-of-fit values and the general interpretability of the solutions, we concluded that a two-dimensional solution parsimoniously accounts for the ratings of treatment stimuli given by participants in the subgroup with optimal adherence.

The solutions for participants with suboptimal adherence ranged from Stress-1 = .14 and DAF = .98 for the one-dimensional solution, to Stress-1 = .07 and DAF = .99 for the four-dimensional solution. Each of these solutions had stress values less than 0.15. We chose to examine the two-dimensional solution since its stress level (.09) was 36% less than the one-dimensional solution, and adding more dimensions did not significantly lower this value. Again, the two-dimensional solution appeared most interpretable. Figures 1 and 2 show the MDS configurations for participants with optimal versus sub-optimal adherence. The configurations depict all items rated by participants except in cases where two or more items occupy similar positions and thereby overlap. Where noted, overlapping items were omitted to improve the clarity of the graphic displays. Some items were highlighted to enhance legibility.

General mapping of treatment behaviours

The first dimension in both configurations, represented on the horizontal axis, is anchored by treatment behaviours perceived as related to approach - avoidance motivation and possessing negative – positive valence. The left side of this dimension includes the

“approach” and “positive” items, as well as the cluster of other treatment behaviours that correspond with varying levels of intrinsic and extrinsic motivation. The right side of the first dimension for both solutions shows the conceptual marker for avoidance, along with a cluster of negative symptoms in addition to the “negative” marker item (“Something that is negative or unpleasant to me”). The proximity of these items to each other at the end of the horizontal dimension, and their clear separation from the other items, suggests that approach – avoidance motivation is a strong element of participants’ view of HIV treatment-related stimuli. Based on the proximity of items to the conceptual markers in both configurations, MDS analyses show that participants were motivated to avoid treatment when it was conceptualised in terms of side effects and other negatively-valenced outcomes. In contrast, participants were prompted to approach or engage with treatment when it was framed in terms of intrinsic or extrinsic motivation.

The second dimension of each solution, depicted on the vertical axis, is anchored by markers for avoidance and extrinsic motivation in the upper half of the configuration while items that participants perceived as related to intrinsic motivation are represented in the lower half. The MDS configurations show that participants in the optimal and suboptimal adherence groups differed in their perception of how various treatment behaviours were related to either intrinsic or extrinsic motivation. In addition to illustrating the differences between the two subgroups, the configurations show how participants’ idiosyncratic views of these types of motivation differ from theoretically-based definitions. These results are outlined below.

Idiosyncratic meanings and subgroup differences

Motivation—Based on self-determination theory we had expected that specific treatment behaviour items would be perceived by participants as related to intrinsic motivation while others would be perceived as related to extrinsic motivation. We found, however, that participants viewed these relationships differently than our theory-based definitions. When adherence behaviour was thought of as “following doctor’s orders,” participants in both adherence groups appeared to view it as intrinsically motivating. As MDS configurations for participants show, the stimulus item for this treatment description was closer to the marker for intrinsic motivation than it was to the marker for extrinsic motivation. This finding contradicted our expectations as the item had been defined a priori as related primarily to extrinsic motivation.

For participants with optimal adherence, we also assumed that the item “taking medicine ... for someone else in my life” would be perceived as corresponding to extrinsic motivation. In contrast, this treatment behaviour appeared to be viewed as more intrinsically than extrinsically motivated. As illustrated in Figure 1, this item situated in the lower half of the third quadrant, was in closer proximity to the marker for intrinsic motivation, and at a considerable distance from the extrinsic marker. In contrast, participants with suboptimal adherence appeared to view this treatment behaviour as more closely related to extrinsic motivation based on its proximity to that conceptual marker versus the marker for intrinsic motivation (see Figure 2).

Further evidence of idiosyncrasy among participants appeared in the number of stimuli that were viewed as related more closely to intrinsic motivation versus extrinsic motivation. Overall, participants with optimal adherence tended to rate items describing treatment-related behaviours as more closely associated with intrinsic motivation than extrinsic motivation (73% versus 27%). MDS analyses indicated that these participants perceived treatment descriptions ranging from basic behavioural tasks (e.g., “taking medicine with water”) to longer range goals or outcomes (e.g., “taking medicine for... someone else in my life” and “bettering my immune system”) as containing more attributes of intrinsic motivation than extrinsic motivation. In contrast, participants with suboptimal adherence

appeared to view a considerably smaller percentage of stimulus items as related to intrinsic versus extrinsic motivation, with a breakdown of 55% versus 45%, respectively. Both subgroups of participants rated descriptions of treatment behaviours framed in terms of side effects or negative outcomes as being more associated with extrinsic motivation than intrinsic motivation.

Participants' focus: Intrinsic versus extrinsic motivation—Based on the proximity of the self-referent statement (“me”) and conceptual markers for intrinsic and extrinsic motivation, participants in both subgroups reported focusing to a greater extent on treatment conceptualisations they perceived as related more to intrinsic motivation than extrinsic motivation. For both subgroups, the proximity between the self-referent statement and the conceptual markers for motivation were similar. As noted above, however, participants with suboptimal adherence viewed nearly half of treatment descriptions as more related to extrinsic motivation while those with optimal adherence viewed fewer than a third in this way (45% versus 27%). Due to the greater proportion of stimuli viewed as related to extrinsic motivation by participants with suboptimal adherence, these participants may have to exert additional effort to maintain their focus on treatment conceptualisations that they view as corresponding with intrinsic motivation.

Discussion

While multidimensional scaling analysis has been used in various kinds of health research (Bishop, 1998; Fisher, Dunn, & Thompson, 2002; Insel, Meek, & Leventhal, 2005; McKirnan, 1978; Patrick & Dziewaltowski, 2000; Psoter, Zhang, Pendrys, Morse, & Mayne, 2003; Tan & Bishop, 1996), a review of the literature indicates that this study may be its first application in examining treatment motivation among patients diagnosed with HIV/AIDS who are currently receiving antiretroviral therapy. Findings from this study revealed that in many cases patients view intrinsic and extrinsic motivation differently than researchers and clinicians would expect. For example, contrary to our expectations, both subgroups of participants viewed “following doctor’s orders” as related primarily to intrinsic motivation rather than extrinsically motivation. A second item we also expected to be perceived as related to extrinsic motivation (“taking the medicine for my family, partner, or someone else in my life”) was instead viewed this way only by participants with suboptimal adherence levels.

Further evidence that views of intrinsic and extrinsic motivation held by researchers and clinicians may not correspond with those held by patients emerged through the visual representations generated in this study. While intrinsic and extrinsic motivation are often depicted in the research literature as polar opposites (e.g., Buckworth, Lee, Regan, Schneider, & DiClemente, 2007; Dacey, Baltzell, & Zaichkowsky, 2008; Satia & Galanko, 2007; Sebire, Standage, & Vansteenkiste, 2009; Tsorbatzoudis, Alexandris, Zahariadis, & Groulos, 2006), our findings suggest that patients receiving antiretroviral therapy may not perceive the differences between these constructs as sharply as do researchers and clinicians. Figures 1 and 2 show markers for intrinsic and extrinsic motivation clearly separated but in closer proximity than markers for approach-oriented and avoidance-oriented behaviour. It appears that although ART patients view intrinsic and extrinsic motivation as distinct, they also perceive considerable similarities between them within the treatment domain. It is possible that ART patients attach multiple meanings to intrinsic and extrinsic motivation which make this relationship more complex than is usually understood with regard to treatment. More research is needed to explore this possibility.

There are limitations to this study that deserve mention. First, the study included only male patients receiving antiretroviral treatment for HIV/AIDS. Future studies should examine the

issues presented here with more diverse samples and with patient populations experiencing different health problems. A second limitation is that the study utilized a cross-sectional research design. For this reason, the relationships that we found between treatment conceptualisations and adherence cannot be interpreted causally. Future studies should employ longitudinal designs to examine issues related to causation. In addition, future research should examine how multidimensional scaling could be used to predict or explain differences in adherence. Despite the stated limitations, the current study strongly suggests that there is a need for innovative approaches to strengthen the assessment of treatment motivation. Findings presented here indicate that multidimensional scaling could play such a role. This research provides examples of how we can use this approach to uncover patients' hidden perceptions of treatment and use this information for both assessment purposes and clinical interventions aimed at promoting adherence.

Clinical implications

While multidimensional scaling analysis has served as a statistical technique in health research, the information it generates suggests valuable clinical applications. Exploratory studies should be conducted to determine how multidimensional scaling could be developed into a clinical tool with data that patients and health care providers could readily access and utilize. The current research highlights several potential contributions of this technique to clinical interventions and the assessment of treatment motivation.

First, as an implicit method of inquiry, multidimensional scaling could be used to identify how specific conceptualisations of treatment are related to either adherence or disengagement from one's regimen. This information could be used in designing interventions tailored to the individual patient. Such interventions could, for example, aim to encourage the patient to frame treatment in terms of conceptualisations that may be related to approach-oriented treatment behaviour. In a similar fashion, problematic conceptualisations that may be associated with treatment disengagement, or avoidance, could be addressed through cognitive-behavioural techniques. For example, a patient may be targeted for counselling if his MDS visual representation suggests he views avoidance-oriented treatment behaviours as similar to a conceptualisation of adherence as "something done for one's family and significant other." Such counselling may be particularly important when family and significant others play key roles in the patient's life.

Relatedly, multidimensional scaling can be used to identify specific situations or contexts where particularly challenging conceptualisations of treatment may be most salient. While people have multiple ways of thinking about or framing their health-related goals, their actual behaviour may be connected to the extent to which a particular perspective is more readily accessible in a given situation (Shadel & Cervone, 2006; Shadel, Cervone, Niaura, & Abrams, 2004). Health research in the area of smoking cessation suggests that idiographic assessments of cognitive appraisals may be needed to better understand how people cope with the health goal demands they face in various situations (Shadel et al., 2004). This research, furthermore, tells us that some people may find certain cognitions more readily accessible in personally challenging situations. Multidimensional scaling could help us identify these situations by including them as markers in stimulus items that patients would be asked to rate for similarity. In this way, we could learn how specific treatment conceptualisations are related to situations such as when the patient is experiencing depressive symptoms or is concerned with serostatus disclosure because he is away from home or has visitors. The markers for these situations could be depicted in visual representations that would show how specific personally-challenging conceptualisations may be particularly accessible based on their proximity. Developing visual maps based on a variety of specific situations could aid in our ability to address patient adherence problems by devising behavioural strategies geared to specific circumstances.

Second, findings presented here suggest a role for multidimensional scaling in checking whether our assumptions about a particular form of motivation correspond to perceptions held by patients. Such an approach may be helpful when developing behavioural strategies or interventions that, for instance, promote patient-provider communication or increase family involvement in treatment. How would patients view such treatment-related behaviours in relation to intrinsic and extrinsic motivation? Multidimensional scaling provides us with an avenue to explore how patients perceive their treatment in terms of these types of motivation, an issue which has theoretical underpinnings and thus implications for intervention design. Our findings showed that intrinsic and extrinsic motivation, frequently considered by both researchers and practitioners in the development of interventions, were perceived differently than expected in connection with specific treatment conceptualisations (e.g., descriptions of treatment in relation to external sources, such as providers or family). Being aware of these variations within a particular patient population may be critical based on how theory suggests these forms of motivation are related to treatment.

Overall, the findings reported here of a close association between optimal adherence and treatment behaviours that patients perceive as related to intrinsic motivation suggest the need to direct more attention to building this form of motivation. This research indicated that participants with optimal adherence seemed to view the vast majority of their treatment behaviours as related more to intrinsic motivation than extrinsic motivation. These treatment behaviours included descriptions of concrete or mundane aspects of treatment, such as “swallowing the medicine.” In contrast, for participants with suboptimal adherence, neither form of motivation appeared to predominate as strongly. These findings regarding intrinsic and extrinsic motivation are consistent with previous research examining these forms of motivation and their relationship to health behaviours (Curry, Grothaus, & McBride, 1997; Lynam et al., 2009; Pelletier, Dion, & Levesque, 2004). We suggest that intrinsic motivation for treatment be strengthened through interventions that employ motivational interviewing or motivational enhancement therapy (Miller & Rollnick, 2002). Given that patients with optimal adherence found both concrete and abstract treatment behaviours to be related to intrinsic motivation, such interventions could be accompanied by information about how general adherence goals are connected by a network of concrete and abstract descriptions of treatment behaviour. The aim of such interventions would be to promote intrinsic motivation for the full range of treatment behaviours as patients in our sample with optimal adherence had been able to achieve.

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Figure 1.

Multidimensional scaling for participants with optimal adherence.

Note. For purposes of clarity, three items that occupy similar positions are omitted from the configuration. These items and the items with which they overlap are: 1) sav [overlaps with me]; 2) on_track [immune and healthy]; and 3) resp [doctor].

Figure 2.

Multidimensional scaling for participants with suboptimal adherence

Note. Two items that overlap with other items are omitted from the configuration to improve clarity: 1) sav [overlaps with me]; and 2) resp [doctor].

Table 1

Stimulus items and labels used in MDS configurations

Behavioural descriptions	
Opening a bottle of medicine (open)	Taking medicine with water (water)
Swallowing the medicine (swallow)	Checking the pills (check)
Saving my life (sav)	Following doctor's orders (doctor)
Taking medicine for family, partner, or someone else in my life (for_others)	
Bettering my immune system (immune)	Being responsible (resp)
Doing something so that I can live healthier (healthy)	
Keeping my life on track (on_track)	Feeling nauseous/vomiting (vomit)
Having diarrhea (diarrhea)	Having problems with sleep (sleep)
Conceptual markers and self-referent item	
Something that is positive or pleasant to me (positive)	
Something that is negative or unpleasant to me (negative)	
Something I choose to do in order to get what I really want (intrinsic)	
Something I do because it's required or someone else wants me to (extrinsic)	
A longer-term goal or result of following my HIV treatment plan (abstract)	
A little thing I do to follow my HIV treatment plan (concrete)	
A thought that makes me want to avoid my HIV treatment plan (avoid)	
A thought that makes me want to stick with my HIV treatment plan (approach)	
Describes the way I usually think about my HIV treatment plan (me)	