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Gough, A., Prior, L., Kee, F., & Hunter, R. F. (2018). Physical activity and behaviour change: the role of distributed motivation. *Critical Public Health*. Advance online publication. <https://doi.org/10.1080/09581596.2018.1535169>

Published in:
Critical Public Health

Document Version:
Peer reviewed version

Queen's University Belfast - Research Portal:
[Link to publication record in Queen's University Belfast Research Portal](#)

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Physical Activity and Behavior Change. The Role of Distributed Motivation.

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Abstract.

Physical inactivity levels are rising globally. In response, public health investigators have sought to design and implement effective interventions to raise levels of physical activity in populations, communities and individuals. Usually, such interventions are built around theories of behaviour change in which notions of motivation and incentivisation loom large. Drawing on focus group evidence derived in the context of a cluster RCT aimed at increasing levels of physical activity in the workplace, this paper offers a critical look at the factors that seemingly stimulate and sustain that activity. In particular, using novel methods of data analysis we illustrate how motives and motivation - often interpreted as a driving force 'in' individuals - can be more usefully seen as distributed; as a property of systems (incorporating technologies, organisational structures, and social interaction) rather than of persons. In our discussion we outline various theoretical as well as empirical grounds for making such claims and conclude by drawing out the implications of our work for public health policy and research.

Key words: Physical Activity, Activity Systems, Behaviour Change, Complex Systems, Extended Mind, Motivation, Public Health.

A problem and a search for solutions.

The World Health Organisation (WHO) has suggested that physical inactivity 'is the fourth leading risk factor for global mortality' and that inactivity levels are rising in many countries (WHO, 2010a; Lee, Shiroma, Lobelo, et al, 2012). Indeed, some have referred to levels of physical inactivity as akin to a "pandemic" (Kohl, Craig, Lambert et al, 2012), and indicated how inactive lifestyles underpin much of the disease burden evident in the richer nations of the world. Many global, continent-wide, national and regional government and health organisations now advocate the benefits of physical activity, and offer guidelines for different age-groups (e.g. WHO, 2010a; 2010b; WHO, 2015; Australian Government, 2014; US Health & Human Services, 2008; Department of Health, (DH) 2011; Québec, 2017). Such recommendations serve, at the very least, to increase awareness of comparative rates of inactivity and to provide realistic activity targets to be aimed at. The real public health problem, of course, is to encourage people to adopt the recommendations. Consequently health policy specialists have sought to design interventions that might encourage people to change their health behaviours. Broadly speaking, such interventions have been aimed at one or other of three constituencies: the population as a whole, specific communities, or individuals. For the most part, however, it is the last of these that has been favoured (Murray, Brennan, French et al, 2017).

As one might expect, behaviour change techniques come in many forms and the language surrounding their use is far from uniform (Michie, Ashford, Sniehotta et al, 2011). Nevertheless, it is clear that the dominant conceptualisation, and the dominant research paradigms called upon in behaviour change interventions, are drawn from psychological models of human behaviour (as has been pointed out by Franco, Bennett, Kanfer, 2002; Davis, Campbell, Hildon et al, 2015; Blue, Shove, Carmona et al, 2016). Indeed, the research on which this paper draws was in large part built on such models (see, Hunter, Brennan, Tang et al, 2016). With respect to individual behaviour change techniques, one increasingly popular strategy to encourage healthy lifestyles has involved the offer of financial incentives (see, Marteau, Ashcroft, & Oliver, 2009). Such a strategy has been used not only to motivate people to increase rates of physical activity (Patel, Asch, Rosin et al, 2016), but also to alter other forms of health behaviour (see, for example, Volpp, Troxel, Pauly et al, 2009; Mantzari, Vogt, Shemilt et al, 2015; Leahey, Subak, Schembri et al, 2015; Paul-Ebhohimhen & Avenell, 2008). In a number of instances, the incentive has taken a material form such as an exchangeable token or cash reward (Mitchell, Goodman, Alter et al, 2013) - as is the case with the research reported on here. Quantitative evidence as to the effectiveness of such incentives, however, is inconclusive (Giles, Robalino, McColl, et al, 2014), and it is the ambiguous nature of research results that provides us with an occasion for reflecting upon the theoretical and conceptual foundations on which much existing research is built, as well as for offering a critical alternative to conventional thinking on such matters.

Our main focus in this paper is on prevailing conceptualisations of motivation and incentivisation. The former is usually considered as a driving force 'in' individuals, and the latter as a trigger to that force (e.g. Liberman, 2004). On the basis of qualitative work described herein, however, and in line with our critical stance, we suggest that motivation should more readily be considered as a distributed or extended property and one that is socially situated rather than a property of individuals. In that sense we suggest that attention needs to be paid to systems of social practice as much as to 'mind' and behaviour (Cohn, 2014; Blue, Shove, Carmona et al, 2016). At a broader level our analysis also has implications for the viability of research built around linear models of cause and effect (Rutter, Savona, Glonti, et al, 2017), wherein behaviour change is viewed as a direct response of individuals to a single, identifiable, input rather than a product of a web of inter-related factors (see also, Resnicow & Page, 2008). In our 'findings' we point to the empirical grounds for making such claims, whilst in our discussion section we reference a range of theoretical positions that would

support those claims. We conclude by discussing the implications of our work for physical activity research and related public health policy in general.

Using incentives to change health behaviour.

Most research aimed at designing effective physical activity interventions tend to be focussed on the psychological needs and drives of individuals, and especially how a motivation to be healthy and active might be stimulated and maintained. Research designs are primarily quantitative in nature and rely on standard methods of statistical inference to draw conclusions. As already indicated, one strategy has hinged on the use of financial incentives (e.g. Strohacker, Galarraga and Williams, 2014; Harkins, Kullgren, Bellamy et al, 2017). A number of issues arise; the first of which concerns whether incentives have a detectable effect on rates of physical activity. Findings on that question have been somewhat equivocal. Thus, a systematic review and meta-analysis by Mitchell, Goodman, Alter et al (2013) concluded that financial incentives increased both attendance at exercise sessions and exercise rates; but only in the short-term. Whilst Finkelstein, Brown, Brown et al (2008), in a study of older adults, detected positive effects for financial incentives, they did not inquire as to whether observed improvements were sustained over time. Conversely, Kullgren, Harkins, Bellamy et al (2014) in a lottery incentive trial, found that intervention group members were no more likely to reach walking goals than controls. On the other hand, Harkins, Kullgren, Bellamy et al (2017) in a study of older adults, observed that their intervention group demonstrated significantly greater levels of physical activity compared to controls. However, the effect was not significant at a follow up four weeks later. Christian, Todd, Hill et al (2016) explored the feasibility of using financial incentives to increase physical activity levels in a teenage population. The authors found that not only did the inducements lead to significant improvements in boys' fitness, but also reduced levels of sedentary behaviour in both sexes.

Financial incentives are, of course, just one of a range of enticements that may be used to encourage behaviour change (Baker, Francis, Soares, et al 2015; Ball, Hunter, Maple et al, 2017; Finkelstein, Haaland, Bilger et al, 2016). Indeed, Marteau and colleagues suggested that financial incentives should be embedded within other behaviour change techniques within a complex intervention (Marteau, Ashcroft & Oliver, 2009). Thus, in terms of physical activity, the Bravata, Smith-Spangler, Sundaram, et al (2007) systematic review of the use of pedometers for increasing physical activity levels, highlighted that both goal setting and feedback were key factors in relation to achieving health outcomes. A randomised trial, by Shin, Yun, Shin et al (2017) examining the feasibility and effectiveness of a combination of both financial incentives and a feedback mechanism using an activity tracker with a smart phone application ('Smartcare'), demonstrated a significantly greater weight loss and increased physical activity levels for those provided with both 'Smartcare' and financial incentives. Rabbi et al's (2015) study also used a mobile phone application to track physical activity and food consumption so as to provide personalised feedback. Results indicated that those who used the application had significantly greater walking (physical activity) levels.

The second issue to note – and one that has already been signalled above - is the disjuncture between short-term (say, less than six months), and long-term effects of an intervention. For example, on the basis of a systematic review and meta-analysis, Mantzari, Vogt, Shemlit et al (2015) suggest that whilst financial incentives increase attainment of the target levels of behaviour from the start until the end of an intervention, thereafter there tends to be a monotonic declining trend and weakening effect over time. Indeed, there is a considerable degree of uncertainty surrounding the maintenance of behaviour change once incentives are removed (Jochelson, 2007; Marteau, Ashcroft & Oliver, 2009). So the evidence tends to suggest that a financial incentive may motivate an individual to engage in a health behaviour change, but longer term effects are more doubtful (Hunter, Tully,

Davis et al, 2013); Burns, Donovan, Ackerman et al, 2012; Cahill & Perera, 2011; Paul-Ebhohimhen and Avenell, 2008; Wall, Mhurchu, Blakely et al, 2006).

Thirdly, and more pertinent to the aims of this paper, we should be aware of a distinct lack of clarity on what exactly it is that incentivises an individual to take up and maintain increased levels of physical activity. Is it the monetary reward, the social interaction, the sense of achievement in reaching targets, the goal setting, or indeed a combination of all of these? Nor is it clear whether the 'incentive' which first motivates a participant is the same incentive that drives a behaviour beyond a starting point (Hunter, Tully, Davis et al, 2013).

Given these somewhat enigmatic findings from many different studies it is not surprising that there are, and have been, numerous calls for clarifying the 'circumstances' under which financial incentives are most effective for achieving a sustainable behaviour change (e.g. Marteau, Ashcroft and Oliver, 2009). Giles, Robalino, McColl et al (2014) further identified a knowledge gap in the literature with regard to the limited amount of qualitative research on the acceptability of health promoting financial incentives. In this paper, however, we argue that it is not merely issues of acceptability and 'circumstance' that require investigation; rather we have to open the 'black box' of intervention studies and inquire into how interventions work from the point of view of participants. It is a task that requires qualitative data as much as quantitative data. Our contribution is offered on the basis of data derived from our own study: the Physical Activity Loyalty (PAL) Study.

Method.

The intervention: Full details of the intervention on which this paper is based, together with the logic model that underpinned it are available in Appendix 1. Suffice to say here that the study was a large cluster randomised controlled trial (RCT) (N=776) of office-based employees from public sector organisations across four sites in two cities in Northern Ireland. The study included a qualitative component (described below), that forms the basis for the current paper. The aim of the study was to improve levels of physical activity in the workplace. A key element of the research design was the recording of study participants' levels of physical activity by means of sensors (wifi-enabled beacons) which were purposefully placed at sites such as bus stops and train stations and along main walking routes (to work) and local parks. The activity so monitored was linked to individual (web-based) accounts. The accounts recorded the time spent and distances involved in activity, such as walking, and the resultant data were converted into 'points' (akin to loyalty points from a retailer). Points could then be exchanged for retail vouchers. By checking their accounts, participants could also access visual (pie chart, and bar charts), and numeric feedback on their performance to date. The researchers further encouraged activity by occasionally offering double points on a particular day, prompting participants to set achievable physical activity goals for a week, and by sending e-mail reminders when participants failed to record any activity during a week.

Collection of qualitative data: At the end of the six month period, a sample of participants (N=62) was invited to focus group discussions. Echoing the claim that qualitative interviews are essentially 'conversations with a purpose' (Kvale & Brinkmann, 2009:5), our focus groups could be described as open discussions with a purpose. In this case the 'focus' (Kamberelis & Dimitriadis, 2014) of the discussion was on issues such as motivation for joining the study; the impact of the voucher and other intervention components on participant behaviour; the nature of any de-motivators to participation, as well as participant views on the intervention in general. Although the focus group generated information on the influence of the intervention on personal levels of physical activity, the researchers also wished to gain insight into group, social, and organisational influences on activity via an exchange of views – and it was interest in the latter that constituted the primary reason for using such groups as an integral component of the research design. The sixty two participants purposively selected from the four intervention sites took part in eight focus group discussions. The groups

included a mix of participants based on gender, age, physical activity levels and length of involvement in the intervention. Each participant was given a £10 gift voucher as a token of thanks for their contribution. The focus group sessions lasted approximately 60 minutes and were audio-recorded and then transcribed (in the style of the UK Data Service, 2017) for analysis. Discussions were facilitated by AG. Analysis of the data was undertaken by LP using novel methods of data capture and representation (as described below).

Data Analysis: Focus group data can be analysed in a number of ways. In designing the qualitative component of this study, however, our interest was in what our participants might say about the factors that either induced them to, or inhibited them from, engaging in physical activity generally and with the intervention specifically. We therefore concentrated directly on the relevant content of the available talk (i.e. participant responses to the issues raised by the moderator), rather than searching for summary 'themes' or 'codes', that 'emerged' from the data. Content itself can be approached from a range of different starting points – including words, phrases, sentences, or exchanges. For these data the basis of the analysis rested on the recognition of 'turns' as 'units' (Sacks, Schegloff & Jefferson, 1974) in the focus group talk. Turn-taking, according to the latter, can be seen as a component of a 'speech exchange system' – and in prompt-response sessions such as we have here, any given respondent's 'turn' offers a natural unit for analysis. Unlike Sacks et al, however, we are not interested in how the system is organised, or produced, or sustained, but rather in the things and issues that are recruited into such turns. So the analytical strategy revolves around three tasks; identifying 'things' that were said to encourage or inhibit physical activity (in the context of the study); assessing the relative importance of things so identified; and noting how the key elements are entangled. The most obvious way of assessing the relative importance (or absence) of any item is by using counts (a conversation analyst might, of course, prefer to highlight verbal emphases); whilst entanglement can be highlighted by examining co-associations between the issues raised by our participants within each turn. Above all, the use of counts avoids reliance on our subjective assessment of, or mere rhetoric about, 'what is most important', or 'significant', or 'relevant' to our participants, and should aid in the public scrutiny of our conclusions. Whilst attention to co-associations places an emphasis on inter-connections and complexity, rather than identification of a series of discrete, single factor influences. Most of the focus groups contained between 175-225 turns. As well as responses to a question posed by the facilitator, a turn could be a response to another speaker, or (more rarely) a simple statement seemingly unrelated to any precursor. Each turn appeared in the transcript as a distinct line or paragraph. For example,

R1M: "The thought that it was being monitored was an incentive, and I suppose maybe just that someone was keeping an eye to give you a wee prod. Now, I'm not sure from your side whether you were monitoring us on an individual basis, but sometimes we got the group email to say that it was double points or something like that...." (Lines 128-133. FG 126)

R2F: "That was a great incentive, definitely". [Several Agree] (Line 134. FG 126)

We can see that within each of the two turns a series of connections are made or implied. Thus, in the turn by R2F [respondent 2, female] above, the word 'incentive' is associated with double points. In the previous turn [respondent 1 male] double points are referred to, but there is an explicit connection or co-association with 'being monitored', and incentives. Double points are also associated with e-mails. Analysis proceeds by identifying and counting such connections prior to entering the data into a matrix of co-associations. Turns by the moderator were excluded from the analysis. Not all turns contained relevant data (for example, talk about a week-end shopping excursion was deemed not relevant to our inquiry, whilst talk directly related to the intervention was considered 'relevant'). For relevant turns, the analytical emphasis was on identifying things that were linked and whether the link was positive (motivating) or negative (de-motivating). In the example above double-points are seemingly positive. The links were subsequently represented as a network of interlocking issues via

the adoption of social network software – in this case *Pajek* (see, de Nooy, Mrvar, Batagelj, 2005). Results are reported on in the following section.

Findings.

Focus group data provide us with evidence as to the kind of things that either made, or failed to make ‘a difference’ (Susser, 1991) to the actions of our participants. They also provide us with insight into how negative and positive influences tended to relate; one to another. Take, for example, the following 10 line extract from focus group 134 (lines 32-41).

32. Moderator: What were your motivations for taking part in the [PAL] scheme?
33. FR1: Try to get healthier, to try to do more exercise, because you aim to do more exercise really. I never heard of it before.
35. FR2: I think the vouchers were definitely an incentive,
36. Moderator: What did you think of the type of vouchers offered?
37. FR2: Yeah, they were good. [Several agree].
38. FR3: Some of them were good, some of the shops were £5 off a £100 so...
39. FR4: It wasn't worthwhile.
40. FR5: They were encouraging you to spend more to get a small amount off. But the restaurants were good.

Lines 32-41 display a number of features germane to our analysis. Perhaps the most striking is the contradiction apparent between the claims of FR1 (Female Respondent 1) in line 35, and FR3 in line 38, as against that of FR4 in line 39, concerning the efficacy of vouchers. There are, however, a number of other features of interest to us in this small excerpt. Note, for example, how the concept of motivation is conflated with that of incentivisation, and how incentivisation, in turn, is conflated with the provision of vouchers. In addition, a variety of ‘motivations’ are cited as stimulants for physical activity (lines 33-35), whilst some assessments of ‘the scheme’ and its designers are indeterminate (lines 40-41). Such overlaps, contradictions, evaluations, and equivocations were characteristic of the talk of our participants.

Focus group data are, of course, especially useful for highlighting agreements and disagreements between participants. In that respect they have a dimension that is plainly missing from one-to-one interview data. Our analysis, however, is aimed at identifying the range of things that were cited as either encouraging or discouraging physical activity, and capturing the intrinsic interconnectedness of the various claims. Such interconnectedness was apparent not only from the study of multiple turns (as above), but also from the study of ‘in-turn’ data. Consider the following; from focus group 126, lines 50-60. The respondent is discussing the things that functioned to incentivise her to engage in regular physical activity, and we can note once again the listing, evaluation, and overlaps that characterise our data.

FR8: “I would say that I wasn't personally incentivised by the bars [i.e. bar charts on the web account], it didn't make me want me to do more, or less. I think I would have been incentivised by the vouchers if they had been personalised a bit more. Again, they weren't local to me, so I really only used my first one when it was all over. I think I would have if they had been a bit more personal and in areas where I would have been able to use them easier. Also we had some problems, I don't think anybody else did, but myself and a colleague had some problems with the trackers at the start. I found that very frustrating and, to be honest, it sort of put me off because it wasn't tracking it properly. That frustrated me, I have to say.”

Given data such as those above, the task of analysis is henceforth to identify the various (positive and negative) influences on individuals, and the interconnection of such influences; the relative importance of influences so identified, and to represent the findings in an informative and parsimonious manner. So, what were the major influences?

Clearly, the vouchers did function to incentivise some, as the extract above (line 35) would suggest. And in the same group, at a later point in the discussion, we also encounter a male respondent claiming that 'I did it mostly for the vouchers, to be honest'; (Line 143), supported by a female respondent adding: "Me too, because I do a lot of walking at the weekends so I didn't have to do it to get the walking, but it was just because I was getting the vouchers for walking so why not do it?" (Lines 144-46). However, there was also evidence that the influence of the vouchers was merely short-term. Thus, a male respondent in FG134 stated that he 'wouldn't walk as much now that the vouchers are gone'; (Line 222). In addition, and as already indicated, there is ample evidence that the vouchers failed to incentivise. The following extracts from FG125 serve to underline that claim.

MR1: " ... the vouchers. They didn't really incentivise me at all" (Line 372)

FR1: "I think once people had signed up for it, but the vouchers weren't really an incentive because they were so [limited]" (Line 376)

As suggested earlier, as well as accumulating vouchers there was a desire among many participants to improve their health status. Thus, one member of FG127 stated, "When I started I would have said my motivation, first of all, was for health benefits and, secondly, to help out with the research ..., but when my tag stopped working and I wasn't getting any more points, my motivation diminished [laughter from those present]", and a female respondent in FG133 referred to "just getting out to improve wellbeing and health as well". Attempting to improve one's health, however, necessarily engaged people in other facets of the intervention, and those facets often came to function as incentives in their own right. Meeting 'targets', was one example of this kind of substitution. So, in the words of our participants the activity was about "watching the targets and what you were trying to achieve." [FG126]. Being able to monitor performance and to meet physical activity targets independently of the vouchers gained also tended to incentivise. "The incentive was watching the bars [i.e. bar charts] go up, and that was the big incentive" [FG126]. "What was motivating me was filling in the circle [i.e. the pie-chart]" [FG134]. It was about, "making your target more than making the money." [FG136].

Those references to bar and pie charts (circles), are suggestive of the fact that the 'target' (and associated goal-setting) was in itself a motivator independent of any financial advantage. (In the words of Lupton (213:399) they point to the 'allure and power' of activity metrics). There was also an apparent incentive in being monitored by the research team (as was implied in the speech extract used in the methods section of the paper). As one of the participants in FG126 put it, [I liked] "the idea that somebody was watching me." Other people (colleagues) and the sense of belonging to a group could also function as a motivator, thus; "There was a social side to it as well. Some of us went out in groups, which was good, enjoyable." [FG127].

"There was a social element to it too, like someone would say "oh, do you want to go outside and get some points?" None of us were cashing them in, it just kind of became a jokey thing, where a colleague would say, if it was dry outside, "we'll go outside and get some points". [FG136]

And the reference to being 'dry outside' is indicative of the potential impact of the weather on activity. "If it was wet, there was no chance" [FG127]. "You were restricted with the weather"

[FG127]. Equally, the spaces in which people walked could also influence willingness to engage with exercise. Hence, the 'lovely green park' spoken of in FG136, functioned as an incentive whereas the siting of the sensors in 'the wrong place' [FG125] functioned as what we have called a 'spoiler' (see, Figure 1). Finally, engagement in the 'scheme' itself – as a whole – seemingly inspired participants to be active. "I think it's a really good scheme; I really enjoyed it. It got people talking and a lot of people really want to do it" (i.e. join the scheme) [FG134]. "The weekly emails helped as well, just to spur you on a Monday morning, just to remind you that you were involved and you had to participate" [FG127].

As for de-motivators, these were linked to a limited number of factors such as the sensors failing to pick up walking activity, participants having their activity incorrectly recorded; or the nature of the vouchers (in the 'wrong' outlets, the 'wrong' places' or localities, for the 'wrong' things). As one member of FG135 stated, "There wasn't really any incentive in the incentives". In addition, and as already stated, the weather and the routes chosen for the tracking exercises could function as de-motivators rather than motivators, (even though the research team had conducted extensive pre-intervention development work on where to site sensors).

It was clear, then, that 'incentives' were configured and structured as a complex web of interconnecting influences. It was a web that enrolled 'things' and especially technology, in addition to humans; environmental as well as social factors; and group and organisational inputs as well as individuals. Even the 'voucher' itself is refracted through, and spoken of variously in terms of 'points' and 'circles', bars and targets. So, any attempt at analysis has, inevitably, to capture the dispersed, yet interconnected nature of the web of incentives that enter into the intervention. Analysis should also enable us to get some sense as to whether participants regarded any one factor or group of factors as more influential than another.

One way in which we can achieve these two aims is by using the language of our participants as reflective of the ways in which they understood and weighed up the relative importance of the interconnected influences. Thus, finding that there is a much larger number of references to being monitored, say, than to social engagement in the workplace is telling us something about the world view of the participants. Finding a large number of cross references from 'points' to vouchers, alerts us to the complexity involved in concluding that 'the voucher' was a straightforward stimulant to action, and so forth. Figure 1 offers a representation of our results for just one (typical) focus group. It shows an interlocking (weighted) network of influences. Within the figure the node size is proportional to the frequency which a specific item (such as the voucher) was mentioned. However, owing to large variations in the number of references to the different components the raw data has been scaled using a square root transformation. The thickness of the lines between nodes is proportional to the number of times that two or more factors were co-associated in a 'turn' of focus group talk. The 'Motivator' node was linked to other nodes when positive associations were evident in the talk of participants. The 'spoiler' node was linked to a node when negative associations were evident. As we can see in Figure 1 most of the negative talk circulated around the technical limitations of the trial technology (e.g. failing to detect walking activity), and to a lesser extent the limitations of the vouchers (e.g. outlets in the 'wrong' part of town). We can further see that a desire to be healthy outweighs the voucher in its reported significance to participants. The influence of others in the workplace ('peers'), the weather, the 'scheme', and the environment were, for this group, less important. Monitoring oneself - what Hall, Johansson, & de Leon (2013) in their studies of 'self-control' usefully refer to as 'computer mediated extrospection' - or just believing that one is being monitored by overseers, was reported as being of considerable influence.

The aforementioned analytical strategy was repeated for each of the focus groups. Appendix 2 summates the results for all groups. Again because of large variations in raw values, the node size

(based on total number of inflows to, and outflows from, the node) has been scaled using a cube root function. Naturally, the scaling reduces visual contrasts in node size, nevertheless, it is clear that 'the voucher' is by no means a dominant actor in the system, and a number of other nodes are larger (e.g. 'points'). More informative, perhaps, is the size of the arcs or lines between nodes, indicating strong negative associations of, say, the weather to physical activity, and the overall significance of the monitoring process to group participants.

Discussion. Distributed Motivation.

Our analysis suggests, then, that the drivers of action are distributed or extended. That is to say, they are distributed over both human and non-human agents, as well as across time and space. Other people in the workplace, the system that monitors and reports on behaviour, the weather, the environment (pleasing green spaces), and the availability of time itself all feed into the web of influences that can incentivise people to be active; and as the incentives ebb and flow across time, space, and occasion, then so does the motivation. In short, motivation is fluid and emergent; so, that which motivates at the start of a project wanes as other stimulants to action come into play.

That assessment is consonant with a range of theoretical perspectives and empirical studies on the relationships between reasoning and action more generally. For example, stimulated by research into artificial intelligence (AI), the notion that thinking, reflection, decision-making, and other psychological phenomena are entirely a matter of mind and brain, has come under increasing scrutiny over recent decades (e.g. Nardi, 1996; Hall, Johansson, de Léon, 2013). Scrutiny has arisen out of both laboratory based studies on AI, as well as a study of what has been called 'cognition in the wild'. With respect to the latter, Hutchins (1995), for example, on the basis of his work on comparative navigation systems, has emphasised how acts of reasoning, remembering, decision-making, and planning (i.e. acts of cognition) are distributed across technological systems that incorporate both human and non-human agents. Indeed, he explains how navigation of a warship is the product of an organised system of actors and actions (radar, maps and charts, rule-books, satellites, compasses, ships officers etc), that extend way beyond the operations of what Latour (1999) has referred to as a 'mind-in-a-vat'; i.e. the autonomous, individual thinker/actor. Other studies of what is sometimes referred to as socially shared cognition (Resnick, Levine, Teasley, 1991) point in a similar direction. Lave (1988:1), studying how people use mathematical knowledge and skills in everyday life, argues that "'Cognition' observed in everyday practice is distributed – stretched over, not divided among – mind, body, activity and culturally organised settings (which include other actors)'. Resnick (1991:1) puts things simply, stating that human cognition is 'not bounded by the individual brain or mind'. In line with such ideas, some researchers have further spoken of distributed motivation (Hall, Johansson, de Léon, 2013); distributed decision making (Rapley, 2008), and even distributed (health) literacy (Edwards, Wood, Davies et al, 2013). Indeed, and as a result of reviewing a wide range of studies along these and similar lines, Kiverstein, Farina, & Clark (2013), have referred to what they call 'the extended mind thesis'.

As the Kiverstein et al (2013) overview indicates, the literature on these issues is vast. However, in the context of such work Suchman (2007), in particular, has raised a number of important issues about the relationship between thinking and action that are directly relevant to our study. For example, on the basis of her AI studies, she has cast doubt on what she calls the planning model of action – the notion that action proceeds on the basis of pre-planned steps. For her, action is best seen as contingent and emergent; wherein 'goals' are recognised only in retrospect. Thus, plans, she argues, are a product of our reasoning about action and not the generative mechanism of action. (From an entirely different and somewhat empiricist perspective Sniehotta, Presseau, Araujo-Soares,

2014, also call into question the planning model of human behaviour). Interestingly, Suchman's claims are reminiscent of much earlier arguments of Mills (Mills, 1940; Gerth & Mills, 1969), who focused directly on motives and motivation, suggesting that the imputation and avowal of motives are things to be explained rather than sources of explanation for human behaviour. That is to say, motives and reasons for action are recruited into our explanatory accounts (Scott & Lyman, 1968) so as to justify what we do (and say), rather than serve as the subjective springs of action. One implication of such a position is that 'as a basic principle', we ought to regard "the 'mental' properties of persons as generated from situated, constitutive practices" (Coulter, 1983:128), and study such practices accordingly. This is, of course, what Suchman does. Coulter's plea for the study of situated social practice also resonates with the work of a number of contemporary public health specialists (e.g. Blue, Shove, Carmona et al, 2016; Cohn, 2014, Nettleton & Green, 2014; Shaw et al, 2017) who have sought to highlight social practice rather than 'behaviour' as a key focal point for public health policy and research.

Clearly, our study is not quite one of 'motivation in the wild', but it is one that takes into account the complexity of everyday circumstance and practice. More pertinently, our observations lead us to the conclusion that, in the field of motivation and incentives, the focus of attention should be not so much on individuals as on systems. Such systems contain tools, technologies, social groups, and environments; that is, a whole gamut of human and non-human actors and agents. Indeed, as a final source of theoretical support we can point to the somewhat aptly named 'activity theory' (Leont'ev, 1978; Nardi, 1996), especially in so far as the theory puts emphasis on external and practical activity in its own right, rather than viewing such action as an expression of the 'activity of consciousness', or mind (Leont'ev, 1978:4). For, according to Leont'ev (1978:3), it is social conditions that 'carry in themselves the motives and aims of [human] activity'. In such ways activity theory not only pre-dates the aforementioned appeals to focus on social practice, but also dovetails neatly with recent trends in the study of non-linear causation (of health and disease) in epidemiology, and a growing recognition of complexity in dynamic systems (e.g. Galea, Riddle, Kaplan, 2010). And whilst work such as ours cannot tell us how to parameterize, say, an agent-based model it can point to the kinds of factors that need to be considered for entry into the model. Whatever the merits of that last claim, however, it is clear that a critical public health approach to physical activity, or lack of it, needs to draw on a much wider range of ideas and concepts than are currently embraced by 'behaviour change' models.

Conclusions and Implications.

Given the desirability of increasing rates of physical activity in communities and/ or national populations, the problem arises as to how public health policy might be designed and implemented so as to get people more active. One of many possible strategies – used to change health behaviours in general – has been to offer incentives for people to adopt healthier lifestyles. The results of such efforts have been uncertain. In that context, we have reported on our own use of incentives for physical activity. Our statistical results are not yet available, but in advance of those we have attempted to clarify what it is that might have incentivised (or failed to incentivise) our research participants. We have done so on the basis of empirical evidence derived from focus groups, and our analysis suggests that incentives are more profitably viewed as being distributed across a range of human, and non-human, individual and group, agents and actors. Furthermore, our data indicate that incentives are not merely distributed but seemingly fluid and changeable in the everyday flow of social action.

Incentives are, of course, commonly seen as the external stimulants for motives sited within the mind and brain of individuals. Motivation, in that sense 'drives' behaviour and is 'reinforced' by

incentives. Drawing on work from a range of theoretical positions (including activity theory, the extended mind thesis, and social practice theory) we have suggested that many assumed psychological properties of individuals can be more usefully viewed as properties of systems. More importantly, we have suggested that the 'system' is regarded not merely as a context for, driver, or container of 'behaviour', but as a field of social practices; and that it is the practices that should constitute the primary focus of our attention. In that respect, the task for the critical health researcher is not so much to discover how this or that 'incentive' might change the behaviour of individuals, but to identify how the different components of a field (or activity system) mix and mesh to produce different population outcomes.

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Figures:

Figure 1: Network of Incentives and Disincentives (FG133)

Appendices:

Appendix 1: Logic Model of the Intervention

Appendix 2: Network of Incentives & Disincentives All Focus Groups