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Multiple outcome measures and mixed methods for evaluating the effectiveness of theory-based behaviour-change interventions: A case study targeting health professionals' adoption of a national suicide prevention guideline

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Interest in behaviour-change interventions targeting health professionals' adoption of clinical guidelines is growing. Recommendations have been made for interventions to have a theoretical base, explore the local context and to use mixed and multiple methods of evaluation to establish intervention effectiveness. This article presents a case study of a behaviour-change intervention delivered to community mental health professionals in one Primary Care Trust, aimed at raising adherence to a national suicide prevention guideline. A discussion of how the theory-base was selected, the local context explored, and how the intervention was developed and delivered is provided. Time series analysis, mediational analysis and qualitative process evaluation were used to evaluate and explore intervention effectiveness. The time series analysis revealed that the intervention was not effective at increasing adherence to the guideline. The mediational analysis indicates that the intervention failed to successfully target the key barrier to adoption of the guidance, and the qualitative process evaluation identified certain intervention components that were well received by the health professionals, and also identified weaknesses in the delivery of the intervention. It is recommended that future research should seek to further develop the evidence-base for linking specific intervention strategies to specific behavioural barriers, explore the potential of theories that take into account broader social and organisational factors that influence health professionals' practice and focus on the process of data synthesis for identifying key factors to target with tailored interventions. Multiple and mixed evaluation techniques are recommended not only to explore whether an intervention is effective or not but also why it is effective or not.

Keywords: behaviour change; intervention; time series analysis; mediational analysis; process evaluation; cluster analysis; health professionals

Introduction

Evidence-based clinical guidelines are aimed at reducing variations in practice and achieving anticipated health benefits for the population. The focus on health

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professionals' behaviour, in the form of their adoption of these clinical guidelines, is an important application of behaviour-change interventions due to the mediating roles that health professionals play in influencing health outcomes of the population. Sir David Cooksey's review of research funding in the NHS (Cooksey, 2006) highlighted the gap in translation between evidence-based research findings and their adoption into health care delivery. There is increasing interest in how to translate research-based findings into practice through enhancing health professionals' uptake of clinical guidelines.

To progress understanding of how best to develop and deliver behaviour-change interventions aimed at increasing health professionals' uptake of clinical guidelines, emphasis needs to be placed on exploring and identifying why an intervention successfully increased guideline adoption, rather than simply establishing whether or not it worked (Craig et al., 2008; Michie and Abraham, 2004).

Establishing why an intervention was successful or not requires a combination of techniques, beyond comparing mean pre- and post-intervention scores on one or more outcome measures. The revised Medical Research Council framework for developing and evaluating complex interventions (Craig et al., 2008) has emphasised the usefulness of having multiple outcome measures, monitoring intervention fidelity and performing process evaluations, to further our understanding of why some interventions are effective and others are not. In addition to these techniques, mediational analyses have also been recommended (Michie and Abraham, 2004) in theory-based intervention studies. Mediational analyses establish whether the constructs targeted by an intervention are successfully changed, in addition to the overall outcome measure. If a mediational analysis indicates that the targeted constructs were successfully changed, this provides a theory-based explanation for the effectiveness of the intervention.

This article presents a case study of a theory of planned behaviour-based intervention aimed at increasing community mental health professionals' uptake of a national suicide prevention guideline. We discuss how the theory-base was selected, barriers to adherence explored, and how the intervention was systemically developed and delivered. Particular detail is provided on how the intervention was evaluated, using mixed methods and multiple outcome measures, in order to gain a deeper understanding of intervention effectiveness and the processes behind it.

Method

The study was conducted in the Mental Health Directorate of one Primary Care Trust (PCT) in the Midlands region of England. Eight community mental health teams operating in the PCT were included in the study, with all qualified health professionals invited to participate ($N = 93$). Ethical approval for the study was granted by Wolverhampton Local Research Ethics Committee.

The clinical guideline

The guideline was a national suicide prevention guideline. It is specified in the Mental Health National Service Framework (Department of Health, 1999) and requires all service-users to receive contact with a qualified community mental health professional within seven days of discharge from hospital. The evidence-base is from the National Confidential Inquiry into Suicides and Homicides in Persons with a

Mental Illness (Department of Health, 2001) which found that suicides in community mental health patients following discharge from hospital peak in the first one–two weeks. The guideline was chosen following consultation with hospital management who identified the guideline as a concern due to low adherence levels at the time the study began.

How the intervention was developed

Selection of theory base

The theory of planned behaviour (TPB) (Ajzen, 1985, 1988, 1991) was selected as the theory-base for exploring factors influencing adherence and for guiding development of the intervention. The TPB proposes causal pathways between attitude (ATT), subjective norms (SN), perceived behavioural control (PBC) and behavioural intention (INT), and between INT, PBC and behaviour. Intention encompasses motivational factors reflecting how hard people are willing to try in order to perform the behaviour, and is proposed as being a key mediator between an individual's beliefs relating to performance of a particular behaviour and their actual performance of the behaviour. Given the causal model proposed between ATT, SN, PBC and INT, it was considered that the TPB could be used to guide development of an intervention that targeted the health professionals' intention to adhere to the guideline as a way of increasing their adherence. In a systematic review conducted by Eccles et al. (2006), self-reported INT was found to be predictive of clinicians' behaviour with a medium to large effect size.

Exploration of barriers to adherence

A semi-structured interview was conducted with one health professional from each of the eight community mental health teams. Questions were designed to explore TPB constructs in relation to guideline adherence. It was considered important to interview at least one health professional from each of the teams, with representation from each of the key professional groups (community psychiatric nurses, occupational therapists, psychiatrists and social workers) because of differences in terms of caseload, remit and client groups. Qualitative methods have been recommended by the National Institute for Health and Clinical Excellence (2007) and the Medical Research Council (Craig et al., 2008) for exploring the local context as part of a "diagnostic analysis" (Centre for Reviews and Dissemination, 1999).

Barriers identified from the interviews were used to develop a TPB survey measuring ATT, SN and PBC in relation to adherence and self-reported INT to adhere. Indirect measures were developed as these have been recommended when developing interventions due to their providing information about the underlying cognitive foundation of the constructs (Ajzen, 2002a). The indirect measures comprised two components each: a salient belief (all of which were identified from the qualitative interviews) and a multiplier, forming a multiplicative composite (see Ajzen, 2002a and Francis et al., 2004). Table 1 provides examples of the wording of the salient beliefs and their multipliers.

As recommended by Francis et al. (2004), the questionnaire was piloted with a small sample of health professionals who were asked to provide feedback on the relevance and wording of the questions. The survey was then administered to all

Table 1. Wording of salient beliefs and their multipliers.

Example of salient belief items for each construct	Example of corresponding multiplier items for each construct
Example of behavioural belief item (ATT construct)	Example of corresponding outcome evaluation item (ATT construct)
My making seven-day contacts for all service-users may reduce the risk of suicide for some (Strongly disagree to strongly agree)	Relative to the other obligations I have, reducing the risk of suicide for some service-users is (Low priority to high priority)
Example of normative belief item (SN construct)	Example of corresponding motivation to comply item (SN construct)
Staff from my team make seven-day contacts for all service-users (Strongly disagree to strongly agree)	How important is it to do what staff from your team do? (Not at all important to very important)
Example of control belief item (PBC construct)	Example of corresponding power item (PBC construct)
If you have a difficult to manage caseload, does this make it more or less likely that you will be able to make seven-day contacts for all service-users?' (Very much more likely to very much less likely)	How often do you have a difficult to manage caseload? (Not at all to all the time)
Example of intention item (INT construct)	
In the forthcoming months, I plan to make seven-day contacts for all service-users (strongly disagree to strongly agree)	

Note: All items were rated on seven-point Likert response scales.

community mental health workers ($N = 93$) and achieved a response rate of 54% ($N = 50$).

Identifying what to target with the intervention

Scores from the salient beliefs and their corresponding multipliers were multiplied together, summed and averaged for each of the constructs. Data were analysed using standard multiple regression to identify the combined power of ATT, SN and PBC at predicting INT. The constructs together accounted for 58% of the variance in INT, with reference to the adjusted R^2 ($R^2 = 0.58$, F (3, 6), $p < 0.0001$), a large effect size (Cohen, 1988). The standardised β coefficients were examined to identify the relative weight of the predictors in the regression equation. Subjective norms were found to be the only significant predictor of INT ($t = 6.622$, $p < 0.001$). To enable greater tailoring of the intervention to the underlying beliefs that most significantly influence health professionals' adherence, a subsidiary analysis recommended by Francis et al. (2004) was performed. Participants were divided into two groups: a higher average intention group (INT scores of 6 or more, $N = 26$) and a lower average intention group (INT scores of 5 and below, $N = 24$). Mean scores from SN items were compared across the two groups using independent samples *t*-tests. All but one of the items significantly differentiated between those

with higher versus lower INT scores (Table 2). The intervention was designed to target these significant normative beliefs, which included perceptions of the expectations of team members and management.

Intervention development and delivery

An educational session was chosen as the most feasible type of intervention due to constraints on staff time identified in the interviews and the literature. Common constraints, including limited availability of health professionals' time (Gerrish and Clayton, 2004) and lack of specific budgets available for intervention efforts (Grimshaw et al., 2004; Whitty, Thomas, & Grimshaw, 2004) need to be taken into account when developing and delivering interventions as failure to do so may lead to interventions that appear well designed, yet are not feasible. To increase accessibility, the intervention was delivered separately to each of the teams at their team bases.

A technique representing step 2 in the six-stage intervention mapping framework (Bartholomew, Parcel, & Kok, 1998), which recommends selecting theory-based methods and translating these into practical implementation strategies, was used to develop the intervention. The normative beliefs were listed, with the intervention designed to target each of them. In addition to including recommended interactive elements in the intervention (Davis et al., 1999; Grol & Grimshaw, 2003; Richens, Rycroft-Malone, & Morrell, 2004), literature was reviewed focusing on implementation strategies that could be used to specifically target normative beliefs. Strategies identified included academic detailing and peer discussion, both characterised as making medium to high use of both knowledge and information transfer and the transmission of norms and values (Mittman, Tonest, & Jacobson, 1992). Regarding

Table 2. Mean scores for normative beliefs: Comparing high versus low intention groups.

Normative belief item	Mean for low intention group (SD)	Mean for high intention group (SD)	Significance (Cohen's *d* effect size)
Most people in my team make seven day contacts for all service-users	28.27 (13.21)	35.79 (12.75)	$p = 0.05$ (0.6)
Most people in my team expect me to make seven-day contacts for all service-users	19.20 (10.94)	37.72 (11.20)	$p = 0.0001$ (1.7)
Management expect me to make seven-day contacts for all service-users	24.65 (13.79)	42.67 (8.40)	$p = 0.0001$ (1.3)
The Care Programme Approach office expects me to make seven-day contacts for all service-users	24.35 (12.67)	36.92 (13.00)	$p = 0.001$ (1.0)
The government expect me to make seven-day contacts for all service-users	28.33 (11.06)	34.29 (12.40)	$p = 0.08$ (0.5)
Staff of a high status make seven-day contacts for all service-users	16.15 (8.43)	25.69 (12.78)	$p = 0.0001$ (0.7)

Note: Normative beliefs were scored on a 1–7 Likert scale and multiplied by motivation to comply items scored on a 1–7 Likert scale: item means can range between 1 and 49.

academic detailing, Mittman et al. (1992) suggested "an effective detailer provides subtle, implicit or explicit suggestions to the target regarding the inappropriateness . . . of the target's current practices and the acceptability of the suggested alternative practices" (p. 417). Peer discussion has been used by other researchers (Verstrappen et al., 2003) and suggested as beneficial in providing health professionals with an opportunity to discuss practice and learn from each other.

Intervention component one: presentation containing persuasive message

The presentation was designed to summarise the evidence-base of the guideline, and to convey that all staff identified as important from the subsidiary analysis value adherence to the guideline and expect others to adhere. The presentation contained factual information summarised as graphs and statements taken from key Department of Health publications documenting the guideline evidence-base. A series of anonymised quotes from local health professionals in the exploratory interviews were presented alongside the graphs, for example, "I think there's a culture within our team that its an important process. . .anyone of us would challenge anyone else in the team if it wasn't done" (comment made by an occupational therapist). It was emphasised throughout the presentation that all staff adhere and expect others to adhere because the guideline has a strong evidence-base and not adhering may place service-users at unnecessary risk.

Intervention component two: Facilitated group discussion

The group discussion was included as an interactive element to enable the sharing of practice and ideas. The discussion was facilitated by the training coordinator who used persuasive communication; making explicit suggestions that the guideline is important, is considered important by all staff, and that there is an expectation that all staff will adhere.

Intervention component three: Vignettes

The vignettes depicted an episode of care where the guideline was adhered to and avoided a near-miss, and an episode where the guideline was not adhered to and resulted in a negative outcome for a patient. The vignettes were developed by the professional head of nursing to reflect commonly occurring scenarios in clinical practice relating to the guideline. The health professionals worked in small groups, sharing their discussions at the end of the session, facilitated by the training coordinator. The training coordinator summarised the discussions in terms of the importance of the guideline and how adhering in one vignette avoided a near miss, and how not adhering in the other resulted in a negative outcome that could have been avoided.

The three components were combined into a single educational session, representing step 3 in the intervention mapping framework (Bartholomew et al., 1998). The intervention was delivered by an experienced training coordinator of the primary care trust, known to the health professionals and a qualified mental health nurse. It was expected that this would offer greater credence to the intervention since Mittman et al. (1992) suggest that failure to use educators known to the health professionals is one reason why interventions aimed at achieving social influence fail

to work. The lead author attended each of the sessions to monitor delivery of the three core components as a fidelity measure.

Evaluation of intervention effectiveness

Three techniques were used to evaluate and to develop a deeper understanding of intervention effectiveness.

(1) *Evaluation one: time series analysis of routinely collected audit data summarising health professionals' monthly rates of adherence to the guideline before, during and after delivery of the intervention*. An interrupted time series analysis was applied to the monthly percentage adherence rates to determine whether the intervention was followed by a significant increase in adherence, having controlled for other possible influences. This evaluation measure enabled assessment of the overall impact of the intervention upon adherence levels. Twenty-seven pre-intervention and 18 post-intervention data points were entered into the analysis.
(2) *Evaluation two: mediational analysis comparing before and after scores across each of the TPB constructs*. The survey was re-administered and pre- and post-intervention scores compared across each of the TPB constructs. Interest was focussed on whether the targeted SN score was higher after delivery of the intervention compared with before.
(3) *Evaluation three: qualitative process evaluation interviews*. Qualitative interviews were conducted with a small sample of health professionals who attended the intervention, as well as with PCT facilitators who were responsible for monitoring guideline adherence. The interviews targeted the third element of a proposed process evaluation for interventions (Hulscher, Laurant, & Grol, 2003), exploring the experience of those exposed to the intervention. Interview questions covered what participants perceived to be the main message behind the intervention, what they learnt from it, what they felt had been most influential, and how they felt the intervention could have been improved. Content analysis was used to analyse the interviews, with comments relating to each of the interview questions noted and related comments grouped together to arrive at a set of separate comments under each of the category headings.

Results

Evaluation one

Autoregressive Integrated Moving Average (ARIMA) modelling was used to identify and control for all non-random patterns in the data (autocorrelation, integration and moving average), before testing the significance of the intervention upon percentage adherence rates. Referring to the integration component, a significant upwards trend in the data was evident, indicating that adherence levels had increased gradually during the course of the research, and so the data series was differenced once to achieve a stationary mean. Examination of ACF and PACF function plots was performed on the pre-intervention data points to look for evidence of autocorrelation and to ascertain the order of the moving average

component: the plots suggested no autocorrelation and a moving average of order 1. Thus, an ARIMA (0, 1, 1) model was applied to the entire data series. It was found that the intervention did not have a significant impact on adherence ($p > 0.05$, $R^2 = 0.27$). For a full discussion of the analysis and findings, please refer to Hanbury, Wallace, and Clark (2009).

Evaluation two: mediational analysis

Of the 28 health professionals who returned the post-intervention survey, 17 had completed the pre-intervention survey and attended the intervention; only these 17 were included in the analysis. The sample represented responses from each of the eight community mental health teams, those with experience of working in health care spanning 0–25 years or more (model group: 10–14 years, $N = 6$) and the age range 18–65 (modal group 25–34 years, $N = 7$). Table 3 summarises the before and after scores for ATT, SN, PBC and INT, which were compared using paired sampled *t*-tests. Only scores of PBC were found to be significantly higher (more positive) after the intervention, $t = 2.429$, df = 16, $p < 0.027$, a medium effect size (0.6) (Cohen, 1988). However, after Bonferroni adjustment to control for family error rate, the probability level is higher than the Bonferroni adjusted probability level ($p = 0.05/4 = 0.01$) suggesting the difference not to be significant.

Evaluation three: qualitative process evaluation

Three community psychiatric nurses (one male and two females), and two primary care trust facilitators who were responsible for monitoring adoption of the targeted guideline, were interviewed. All three community psychiatric nurses had attended the intervention; however, only one of them had returned the post-intervention survey.

The main messages from the intervention were perceived to be that the guideline is PCT mandatory, and that it is better to make seven-day contacts for all service-users rather than only those considered high risk due to the risk of relapse. This suggests that the presentation component of the intervention, which provided information on the guideline evidence-base, may have had some impact, in particular the statistics that were summarised:

> It showed in the training session that its better for everybody, because even the sort of slightest relapse can be identified in that seven-days and stop them needing further interventions or rushing into hospital, so I think before the training session you would

Table 3. Before and after scores for TPB constructs.

Construct	Mean score (SD) pre-intervention	Mean score (SD) post-intervention	Significance (Cohens' *d* effect size)
ATT	32.55 (9.06)	33.27 (11.54)	$p = 0.80$ (0.06)
SN	29.78 (9.23)	30.88 (9.29)	$p = 0.76$ (0.12)
PBC	17.98 (2.71)	20.95 (5.34)	$p = 0.03$ (0.56)
INT	5.87 (1.06)	5.88 (1.49)	$p = 0.84$ (0.2)

Note: Salient beliefs for each construct were scored on a 1–7 Likert scale and the corresponding multipliers were scored on a 1–7 Likert scale: item means can range between 1 and 49.

> think that perhaps it'd only be people that are high risk, but I think it highlighted that its useful for everyone. (Community psychiatric nurse)

More positive perceptions of management support for the guideline were also discussed:

> Its easy to knock management but they want good care to be provided at the same time as everyone else...I think for genuine reasons. (Community psychiatric nurse)

When asked which component of the intervention was most influential, all participants mostly valued the facilitated group discussion, which provided an opportunity for the health professionals to reflect on practice, voice their opinions and raise any issues:

> The discussion followed on from the presentation and I think people, not only voiced their opinion but also voiced what to them was preventing them doing it, they brought their thoughts and anger. (Michelle – facilitator)

Issues concerning responsibility for making seven-day contacts emerged during the interviews, with the suggestion that ward staff create a barrier to adherence through not communicating discharge dates with community teams. It was commented by Michelle (a PCT facilitator) that ward staff should have attended the intervention, with this suggested as an improvement that could be made to the intervention:

> I don't think there was across the board attendance at all, I do think once again there's a shortage of ward staff there because, my feelings with seven-day contacts, the ward staff always feel its up to the community staff, its not a partnership, the ward staff are not telling them that people have been discharged. (Michelle – facilitator)

Discussion

This article has provided a case study of a behaviour-change intervention targeting community mental health professionals' uptake of a clinical guideline. Addressing the criticism that intervention reports typically fail to provide adequate detail regarding intervention design and delivery, and incorporating recommendations by the Medical Research Council (Craig et al., 2008) for more studies exploring why interventions have been more or less effective through use of different techniques and outcome measures, this article has detailed the multiple, mixed method techniques employed to evaluate and understand intervention effectiveness.

Routinely collected audit adherence data supplied by the PCT indicated that there was a clear increase in adherence to the guideline throughout the duration of the research. However, it is not possible to attribute this increase in adherence to the effects of the intervention as when this underlying upwards trend in adherence was controlled for in the time series analysis (evaluation one), the intervention was not found to have a significant impact on adherence levels above this underlying trend. The mediational analysis (evaluation two) further found that the intervention was not effective at increasing the targeted SN construct of the TPB. Finally, the interview findings that enabled a process evaluation (evaluation three) suggest that certain components of the intervention were well received by participants, in

particular the facilitated group discussion, yet also highlighted possible weaknesses of the intervention, notably the lack of attendance of ward staff compared with community mental health professionals.

The first possible explanation for the findings of this study are that the intervention did not include the most effective components, either in its design or delivery, to successfully change SN. This suggestion is based on the finding from the mediational analysis – (evaluation two) – that SN was not significantly higher post-intervention. Literature was reviewed to identify implementation strategies and techniques that could target SN, and a systematic approach to intervention development was employed, guided by Bartholomew et al.'s intervention mapping approach. However, to date there is still limited evidence available to guide researchers in selecting the most appropriate implementation strategies to target the most influential constructs identified from a diagnostic analysis. There is also limited evidence available to guide decisions over what dose of the intervention is needed; a single session of the educational intervention, however well designed, may not have been an adequate dose to achieve sustainable behaviour-change. The inclusion of the process evaluation measure (evaluation three) enabled exploration of the health professionals' perceptions of which intervention components were more and less successful. The finding that the facilitated group discussions were considered to be effective is valuable for future interventions targeting health professionals' adoption of clinical guidance. Similarly, the finding that a particular barrier to adherence was considered to be neglected by the intervention: communication of discharge dates between ward- and community-based teams, gives insight into a possible short-coming of the intervention. This barrier was identified from the qualitative interviews conducted during the diagnostic analysis and was developed into a single PBC item in the survey; however, due to only SN being identified as a significant predictor, this potentially highly influential barrier to adherence was overlooked. This is an important finding from the process evaluation and suggests that overly prescriptive use of theories can lead to possibly important factors being overlooked, and supports the recommendation made by Hanbury, Thompson, and Mannion (in press) that greater attention needs to be paid to the process of data synthesis in the development of behaviour-change interventions.

The second possible issue to consider as an explanation for why the intervention was not effective is whether the TPB is the most appropriate theory to use to guide intervention development. The TPB was selected due to it having been used in previous studies of professional behaviour, and due to the causal model it proposes between ATT, SN, PBC and INT, and between INT and behaviour. Analysis of the survey data found the model to account for 58% of the variance in health professionals' INT to adhere; comparable or higher than found in previous research with health professionals (Puffer & Rashidian, 2004; Walker, Grimshaw, & Armstrong, 2001). The high proportion of variance accounted for suggests that the TPB has potential as a framework for guiding a diagnostic analysis (Centre for Reviews and Dissemination, 1999) of the barriers to adopting clinical guidelines. The Eccles and The Improved Clinical Effectiveness through Behavioural Research Group (2006), however, cite the TPB as an example of a theory that is focussed on the behaviour of individual clinicians and suggest it not to be appropriate in contexts where, for example, broader issues may influence guideline adoption rather than solely health professionals' attitudes and motivation. Indeed, growing consensus has developed that health professionals' behaviour and subsequent behaviour-change

can be influenced by factors at a number of levels; Hagger (2009), Craig et al. (2008) and Grol, Bosch, Hulscher, Eccles, and Wensing (2007), for example, emphasise the importance of understanding the individual, as well as wider social and environmental influences upon behaviour. Therefore, it is possible that constructs such as ATT, SN and PBC are important in influencing health professionals' adoption of guidelines, but that broader and higher level constructs, such as organisational culture, are also important to consider when trying to change professional behaviour.

A significant limitation of this study is the increasing attrition through the sequential phases (pre-intervention survey, participation in the intervention, and post-intervention survey), which led to a small sample size for evaluation two. Steps were taken to increase the response rate of the survey, for example, with second copies of the questionnaire sent to non-responders, and a monetary prize offered to the teams with the highest response rate. The intervention was also designed to be accessible to the health professionals, and the research was well publicised. The high attrition in this study is likely to be common to sequential, longitudinal research in health services settings, with staff rotation, turnover and workload issues presenting difficulties. Acceptable baseline measures of the TPB constructs were, however, achieved with a response rate of 50% for the pre-intervention administration of the survey; with baseline measures sometimes entirely missing from theory-based process evaluations (e.g. Ramsay, Thomas, Croal, Grimshaw, & Eccles, 2010). Furthermore, the robustness of the study has been strengthened by using multiple and mixed evaluation measures through inclusion of audit adherence data (evaluation one) and the qualitative process evaluation (evaluation three).

This study has demonstrated the strength of using multiple and mixed methods of evaluation to provide richer information to help develop an understanding of intervention effectiveness. It is suggested that future research continue to strengthen the evidence-base for guiding selection of specific strategies to target specific constructs, and focus on exploring theories that consider a broader range of factors influencing health professionals' adoption of guidance. We further suggest that future research should consider the process of data synthesis following exploration of the local context, to ensure that all important factors influencing adherence are targeted by behaviour-change interventions.

References

Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. In J. Kuhl & J. Beckman (Eds.), *Action-control: From cognition to behaviour* (pp. 11–39). Berlin: Springer-Verlag.

Ajzen, I. (1988). *Attitudes, personality and behaviour*. Milton Keynes: Open University Press.

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes*, *50*, 179–211.

Ajzen, I. (2002a). Constructing a TPB questionnaire: *Conceptual and methodological considerations*. Retrieved January 19, 2010, from http:/www-unix.oit.umass.edu/~ajzen/

Bartholomew, L.K., Parcel, G.S., & Kok, G. (1998). Intervention mapping: A process for developing theory and evidence based health education programs. *Health Education and Behaviour*, *25*(5), 545–563.

Centre for Reviews, Dissemination. (1999). Getting evidence into practice. *Effective Health Care 1999*, *5*(1), 1–16.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Cooksey, D. (2006). *A review of UK health research funding*. London: The Stationary Office.

Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Pettigrew, M. (2008). *Complex Interventions Guidance*, Medical Research Council. Retrieved December 16, 2009, from http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC004871

Davis, D., Thompson, M.A., Freemantle, N., Wolf, F.M., Mazmanian, P., & Taylor-Vaisey, A. (1999). Impact of formal continuing medical education: Do conferences, workshops, rounds and other traditional continuing education activities change physician behaviour or health care outcomes? *JAMA*, *282*(9), 867–874.

Department of Health. (1999). *National service framework for mental health: Modern standards and service models*. London: Department of Health.

Department of Health. (2001). *Safety first: Five year report of the national confidential inquiry into suicide and homicide by people with mental illness*. London: The Stationary Office.

Eccles, M.P., Hrisos, S., Francis, J., Kaner, E.F., Dickinson, H.O., Beyer, F., & Johnston, M. (2006). Do self-reported intentions predict clinician's behaviour: A systematic review. *Implementation Science*, *1*, 28, doi: 10.1186/1748-5908-1-28.

Eccles, M. & The Improved Clinical Effectiveness through Behavioural Research Group. (2006). Designing theoretically-informed implementation interventions. *Implementation Science*, *1*, 4, doi: 10.1186/1748-5908-1-4.

Francis, J.J., Eccles, M.P., Johnston, M., Walker, A., Grimshaw, J., Foy, R., … Bonetti, D. (2004). Constructing questionnaires based on the theory of planned behaviour: A manual for Health. Centre for Health Services Research: Newcastle Upon Tyne, United Kingdom. Retrieved June 14, 2008, from http://www.rebeqi.org/ViewFile.aspx?itemID=212.

Gerrish, K., & Clayton, J. (2004). Promoting evidence-based practice: An organizational approach. *Journal of Nursing Management*, *12*, 114–123.

Grimshaw, J.M., Thomas, R.E., Maclennan, G., Fraser, C., Ramsay, C.R., Vale, L., … Donaldson, C. (2004). Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technology Assessment*, *8*, 6.

Grol, R., & Grimshaw, J. (2003). From best evidence to best practice: Effective implementation of change in patients' care. *The Lancet*, *362*(9391), 1225–1230.

Grol, R.P.T.M., Bosch, M.C., Hulscher, M.E.J.L., Eccles, M.L., & Wensing, M. (2007). Planning and studying improvement in patient care: The use of theoretical perspectives. *The Millbank Quarterly*, *85*(1), 93–138.

Hagger, M.S. (2009). Theoretical integration in health psychology: Unifying ideas and complementary explanations. *British Journal of Health Psychology*, *14*, 189–194.

Hanbury, A., Thompson, C., & Mannion, R. (in press). Statistical synthesis of contextual knowledge to increase the effectiveness of theory-based behaviour change interventions. *Journal of Health Services Research and Policy*.

Hanbury, A., Wallace, L., & Clark, M. (2009). Use of a time series design to test effectiveness of a theory-based intervention targeting adherence of health professionals to a clinical guideline. *British Journal of Health Psychology*, *14*, 505–518.

Hulscher, M.E.J.L., Laurant, M.G.H., & Grol, R.P.T.M. (2003). Process evaluation on quality improvement interventions. *Quality and Safety in Health Care*, *12*, 40–46.

Michie, S., & Abraham, C. (2004). Interventions to change health behaviours: Evidence based or evidence inspired? *Psychology and Health*, *19*(1), 29–49.

Mittman, B.S., Tonest, X., & Jacobson, P.D. (1992). Implementing clinical practice guidelines: Social influence strategies and practitioner behaviour change. *QRB*, *18*, 413–422.

National Institute for Health, Clinical Excellence. (2007). Behaviour Change at Population, Community and Individual Levels (Public Health Guidance 6). London. Retrieved December 16, 2009, from http://www.nice.org.uk/PH6

Puffer, S., & Rashidian, A. (2004). Practice nurses intentions to use clinical guidelines. *Journal of Advanced Nursing*, *47*(5), 500–509.

Ramsay, C.R., Thomas, R.E., Croal, B.L., Grimshaw, J.M., & Eccles, M.P. (2010). Using the theory of planned behaviour as a process evaluation tool in randomised trials of knowledge translation strategies: A case study from UK primary care. *Implementation Science*, *5*, 71.

Richens, Y., Rycroft-Malone, J., & Morrell, C. (2004). Getting guidelines into practice: A literature review. *Nursing Standard*, *18*(50), 33–40.

Verstappen, W.H.J.M., Van Der Weijden, T., Sijbrandij, J., Smeele, I., Hermsen, J., Grimshaw, J., & Grol, R.P.T.M. (2003). Effect of a practice-based strategy on test ordering performance of primary care physicians. *JAMA*, *289*, 18.

Walker, A.E., Grimshaw, J.M., & Armstrong, E.M. (2001). Salient beliefs and intentions to prescribe antibiotics for patients with a sore throat. *British Journal of Health Psychology*, *6*, 347–360.

Whitty, P., Thomas, R., & Grimshaw, J. (2004). Disseminating and implementing guidelines: How feasible is it? *Clinical Governance*: *An International Journal*, *9*(1), 8–10.