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Contrasting implicit and explicit measures of attitudes to complementary and alternative medicines

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ABSTRACT

We aimed to contrast implicit and explicit measures of attitudes towards complementary and alternative medicines, to determine which best predicts medicine adherence. 117 participants from Université Grenoble Alpes completed online measures of attitudes towards complementary and alternative medicines, including implicit measures (Affect Misattribution Procedure (AMP); Implicit Association Test (IAT)), and explicit measures (Beliefs about Medicines Questionnaire (BMQ), modified explicit AMP); and self-reported medicine adherence (Medication Adherence Scale (MARS); Probabilistic Medication Adherence Scale (ProMAS)). AMP measures of implicit and explicit attitudes predicted beliefs toward medicine and medicines adherence. Models including implicit measures were stronger than models with explicit measures alone. Further, the AMP predicted beliefs toward medicine as well as medicine adherence, and the AMP was a stronger predictor compared to the IAT, although the IAT predicted adherence. These preliminary findings suggest that 'hot' implicit attitudes are a useful predictor of people's medicine choices, and that the AMP outperforms the IAT.

1. Introduction

Whether people choose to use complementary and alternative medicines (CAM) can be predicted by individuals' attitudes, as well as beliefs about the illness they are intending to treat or prevent [1], and attitudes may have a direct impact on adherence [2]. However, self-reported attitudes can often be poor predictors of behaviours. One way in which this can be explained is that there are two types of processes underlying attitudes towards CAM: impulsive processes that occur automatically after exposure to an appetitive (or positively valued) stimulus, and more high-level, reflective cognitive processes that inhibit the automatic impulsive process (see e.g., Strack & Deutsch [3]).

This distinction has important implications for understanding how people make decisions about complementary therapies. Sometimes, it may be through a more deliberative choice, but often it may be through an automatic, relatively-less-aware decision process. The automatic, impulsive system operates in much the same way as current memory models, where evaluative responses and objects are associated and reactivated by spreading of activation through a network of nodes. Recent work has demonstrated that both types of process influence adherence to medicines [4,5], and decisions about CAM [6].

Reflective, deliberative processes are usually measured by direct (explicit) evaluation of an object (e.g., Do you have a positive opinion of herbal products?). In contrast, the impulsive (implicit) affective process are measured with specific tools sensitive to the automatic responses from the participant to the stimulus (usually involving reaction time of decisions involving the target product, such as herbal medicines). Implicit measures have two advantages. First, they evaluate the automatic responses of individuals to a product or object, which are more likely to influence behaviours when self-regulatory resources are depleted, for example when one is under time pressure (e.g., at a pharmacy) or when one is sick and already has to deal with parallel, constraining tasks. Second, they are less sensitive to social desirability, since the response is less controllable by the participant. The most widely used implicit measure is the Implicit Association Test (IAT) [7]. However, the IAT has been the object of several criticisms regarding its construct validity as well as its sensitivity to response strategies by participant to modify their automatic response [8]. Hence, rather than attitude, IAT scores may represent attentional asymmetries or merely knowledge about common environmental associations.

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An alternative account of the processes that underlie how these implicit attitudes are accepted and reactivated is the misattribution model [9]. According to this model, implicit attitudes can be measured with the Affect Misattribution Procedure (AMP), where participants are instructed to assess the pleasantness of a Chinese pictogram, which is immediately preceded by a brief (75 ms) presentation of a prime. The evaluative response elicited by the prime is then falsely attributed to the pictogram. The AMP has numerous validations [10] and psychometric properties comparable to the IAT [11]. It also offers several advantages: a much simpler structure compared to the IAT; a score for each prime rather than a relative judgement; direct evaluative judgments, in contrast to all other implicit measures that are based on reaction times as a proxy for evaluative judgements; and a structure easily modifiable to measure explicit attitudes in a similar way – as opposed to comparing reaction times with Likert scales.

The Medicines IAT has already demonstrated some potential in predicting CAM use [6], but our goal here was to further demonstrate the usefulness of implicit measures in addition to traditional explicit measures, but also to contrast the IAT with the AMP. The two tests here use only herbal medicines as stimuli representing CAM. For the AMP, this is because stimuli are presented for less than a quarter of as second, so it is essential that the content of the image can be recognised in this time. We considered that most other types of complementary or alternative therapy could not be represented by a widely recognisable image at that speed. The IAT can use word stimuli, so it could be possible to use words representing other types of complementary or alternative therapies; however, the Medicines IAT has been previously validated and shown to have predictive ability for a broader range of complementary therapies, not only herbal medicine. The exploratory nature of this work also meant that we chose to use validated measures of adherence to conventional medication as our primary outcome, because we anticipate that people with more positive attitudes towards complementary therapies are less likely to be adherent to conventional medicine.

Thus, our main objective was to establish whether implicit and explicit attitudes towards conventional and alternative medicines predict beliefs about medicines, and self-reported medicine adherence. Our secondary objective was to compare the predictive validity of two implicit measurement tools, the IAT and AMP.

2. Materials & methods

2.1. Participants

We targeted a sample of 150 participants, with a minimum of 84 (based on power of 0.8, two-tailed alpha of .05 and a correlation effect of 0.3). One hundred and seventeen participants from Université Grenoble Alpes (72% female, mean age 20.4, SD = 4.6) were recruited via a university internal mailing list. At the time of data collection, the Université Grenoble Alpes did not have an ethics committee; however online informed consent was obtained from all participants included in the study, which was designed in accordance with the 1964 Helsinki declaration and its later amendments and comparable ethical standards.

2.2. Measures

All experimental files and data for this project, along with stimuli, are on the OSF page for this project https://osf.io/2an6h/.

2.2.1. Implicit measures of attitudes towards medicines

The Medicines IAT [6] (https://osf.io/vpy57/) uses herbal and conventional medicine names with positive and negative words to produce an index of attitude towards medicines (more positive scores indicate a more positive attitude towards conventional medicine). Stimuli were translated into French, with similar local medicines selected where appropriate. The Medicines IAT is composed of five blocks. In an initial 12-trial block, participants respond with a right ('I') or left ('E') key to categorize briefly presented herbal or conventional medicine names. The second block (12 trials) repeats this pattern but with positive and negative words. The third and fifth block (26 trials) combines these tasks, so that participants are presented with both medicine and positive/negative words. These blocks occur in counterbalanced order across participants, for one block with the one response key pairing conventional and positive and the other response key pairing herbal and negative, and the other block with reverse: conventional with negative and herbal with positive. The fourth block is a practice block similar to block two (12 trials) but with positive and negative switching response keys. The time between the trials was 250 ms; after a false classification an error message occurred immediately, which required a correction before the onset of the next trial. The IAT *d* score [12] was calculated for each participant. A positive *d* score indicates a stronger association between 'positive' and 'conventional medicine' (as well as 'negative' and 'herbal medicine'), while a negative score indicates the reverse relationship (i.e. 'positive' and 'herbal medicine' as well as 'negative' and 'conventional medicine').

We also used a newly developed Medicines AMP based on the procedure of Payne et al. [10] as a measure of implicit attitudes toward herbal and conventional medicine. We used 16 different medicine product pictures (8 herbal/8 conventional), with 8 showing packaging, and 8 showing the products/herbs (balanced evenly across herbal and conventional) and a neutral stimulus (a grey square) as primes (similar to [21]). All medicine product pictures were comparable regarding composition, complexity and colour, and were displayed with the same 640 × 590 resolution (images available here https://osf.io/2an6h/). The task comprised 48 trials (each medicine prime was seen twice, that is 32 trials; with the grey square being presented 16 times). After each prime, one of 48 Chinese pictograms were randomly presented. For each trial, the prime was presented onscreen for 200 ms, followed by an empty screen for 100 ms (300 ms SOA), followed by the Chinese pictogram for 100 ms and a mask that stayed onscreen until the participant entered a response. Participants were instructed to rate the Chinese pictogram without taking the prime into consideration on a scale ranging from −2 (very pleasant) to 2 (very unpleasant).

A modified version of the AMP [13] was used to assess explicit attitudes, to produce an explicit measure that was as structurally similar as possible to ensure that any variation was attributable to implicit versus explicit processes. That is, it used the same stimuli, measured on the same scale (as opposed to using verbal propositions and a Likert scale). In this variation of the AMP, participants were clearly instructed to evaluate the (medicine) prime and ignore the Chinese pictogram (the opposite of the implicit instructions).

2.2.2. Explicit measures of attitudes towards medicines

The Beliefs about Medicines Questionnaire General (BMQ) [14] measures attitudes towards medicines, and has a previously developed French translation [15]. The BMQ general consists of 8 items, each comprising a 5-point Likert scale ranging from 1 'strongly agree' to 5 'strongly disagree', including perceptions of harm (general-harm, e.g., 'Medicines do more harm than good') and overuse (general-overuse e.g., 'Doctors use too many medicines'). Items were summed such that higher values denote stronger beliefs. The reliability of the BMQ-General was good (ω = 0.80).

2.2.3. Adherence

Two measures of adherence were used, MARS,[1] [17], as well as the newer ProMAS scale [18]. The ProMAS (originally in Dutch) was

[1] Two new adherence scales, both named Medication Adherence Rating Scale (MARS) were published in the early 2000s. It was our intent to use the other [22] MARS [16] but we were not aware of the second scale when instructing a student who was assisting with the programming.

published with a descriptive English translation. This translation was modified by a native English speaker, back-translated by a native Dutch speaker, and inconsistencies were discussed and resolved. A similar procedure was then used to translate the English version into French. Rasch analysis was performed using the eRM package [19] in R. For survey-type scales, Mean Square values between 0.6 and 1.4 are considered reasonable. Infit mean squares for our translated French ProMAS ranged from 0.81 to 1.18, while outfit mean squares ranged from 0.58 to 1.30. Lower values suggest some degree of redundancy, so overall, the model fit well, with some evidence for redundant items. Item fit, French language version and English translation of the items are presented in Table A.1. Rasch scaling provides evidence of scale reliability, but omega was also high at 0.90.

The MARS was translated from English to French, back-translated, and a consensus version produced as outlined above. Participants respond to each of ten Yes/No items. Reliability for the MARS was lower ($\omega = 0.62$). The French version is presented in Table A.2.

2.2.4. Demographics

Participants reported their age in years, gender, knowledge of Chinese or Japanese language (5-point Likert scale), and recognition of any Chinese characters (Yes/No) was recorded, as well as any current and recent medicines (details in Table A.3).

2.3. Procedure & data analysis

Following informed consent, participants completed the IAT, explicit AMP and implicit AMP in counterbalanced order, followed by the questionnaire measures (BMQ, ProMAS, MARS, current and recent medicines use; in counterbalanced order), then the demographic questions. All materials were presented using Inquisit Web. Regression analysis was used, with partial correlation (r_p) presented as a measure of effect size. In addition, Bayesian analysis were conducted to evaluate which model including implicit and/or explicit measures allows for more support for the alternative hypothesis. We report BF_{10} provides strength of evidence, with values over 1 providing increasing support for the alternative hypothesis; as values decrease from one, they provide increasing support for the null hypothesis. One participant was excluded from analysis due to high deleted studentized residuals and/or a high Cook values. Pairwise deletion was used, with around twenty participants missing data on the implicit measures. Following Peters [20], we use omega as a primary measure of reliability. Correlations between all measures are presented in Table A.4.

3. Results

3.1. Do implicit attitudes toward herbal and conventional medicine predict medicine adherence?

3.1.1. Data preparation – score calculations

To determine whether attitudes towards conventional and alternative medicine predict self-reported medicines adherence behaviour, multiple regression analyses were conducted with mean implicit AMP raw scores separately for conventional (YC-AMP) and herbal medicine pictures (YH-AMP), mean explicit AMP raw scores for conventional (XC-AMP) and herbal pictures (XH-AMP), and IAT *d* scores as predictors. A positive *d* score means a stronger association between conventional medicines and positive (and conversely between herbal medicines and negative).

3.1.2. Analyses on MARS

For the MARS adherence measure, the model was significant F (5,88) = 2.8, p = .02, with positive implicit conventional AMP scores, t (88) = 2.2, p = .03, $r_p = 0.22$, 95% CI [0.01, 0.41], and a marginally significant negative IAT score toward conventional medicines, t (88) = −1.8 p = .07, $r_p = 0.18$, 95% [-0.03, 0.37], along with negative explicit herbal AMP scores, t(88) = -2.3, p = .02, $r_p = -0.23$, 95% [-0.42, −0.03]. An equivalent Bayesian analysis found evidence for models containing only explicit herbal AMP scores $BF_{10} = 4.8$, explicit herbal AMP scores combined with implicit conventional AMP scores $BF_{10} = 4.5$, and with the further addition of the IAT, $BF_{10} = 4.1$.

3.1.3. Analyses on ProMAS

Parallel analyses to predict the ProMAS adherence scale found the overall model not significant, F(5,88) = 0.9, p = .5, with the AMP implicit attitudes towards medicines being the strongest albeit not significant predictor, t (88) = 1.8, p = .08, $r_p = 0.18$, 95% CI [-0.02, 0.38]. An equivalent Bayesian analysis did not support the inclusion of any predictor in the model, all $BF_{10} < 1$ (See *Tables A.5*, *A.6* and *A.7* for all estimates).

3.2. Predictive validity of the AMP compared to the IAT

3.2.1. Data preparation – score calculations

To compare the predictive validity of the AMP with the IAT, difference scores for the implicit AMP (YD-AMP) and explicit AMP (XD-AMP) were calculated, to facilitate comparison with the IAT score, which is already a difference score. For each of the implicit and explicit AMP, the mean alternative medicine score was subtracted from the mean conventional medicine score, meaning higher values equate to more positive attitudes toward conventional medicine.

3.2.2. Analyses on MARS

The regression model predicting the MARS was significant, F(3, 90) = 3.0, p = .03. More positive attitudes towards conventional medicine on the implicit AMP difference score was marginally associated with higher adherence, t(90) = 1.9, p = .06, $r_p = 0.20$, 95% CI [-0.01, 0.39], with a marginal association for the IAT, t(90) = −1.8, p = .08, $r_p = -0.18$, [-0.37, 0.03]. No effect was found for the explicit AMP difference score, t(90) = 1.3, p = .19, $r_p = 0.13$, [-0.08, 0.33]. Bayesian linear regression found no attitude measures useful predictors of MARS, all $BF_{10} < 1.7$.

3.2.3. Analyses on ProMAS

The overall model for ProMAS was not significant, F(3, 90) = 1.4, p = .3, with the strongest marginal effect where more positive attitudes toward conventional medicines measured by the implicit AMP predicted greater adherence measures by ProMAS, t(90) = 1.7, p = .09, $r_p = 0.18$, 95% CI [-0.03, 0.37]. Bayesian linear regression found no attitude measures useful predictors of adherence as assessed by ProMAS, $BF_{10} < 1$.

3.2.4. Analyses on BMQ

More positive scores on the beliefs about medicine questionnaire (BMQ) were predicted by stronger positive implicit attitudes (YC-AMP) towards conventional medicines, F (3, 90) = 3.8, p = .01. This was underpinned by a marginal positive association with the IAT, t (90) = 1.9, p = .07, 0.19, 95% CI [-0.02, 0.38], and the implicit AMP difference score, t(90) = 1.9, p = .06, 0.19, [-0.01, 0.38], but no association with the explicit AMP difference score, t(90) = −0.6, p = .6, −0.06 [-0.26, 0.15]. This was consistent with Bayesian analysis that showed support for the both the IAT, $BF_{10} = 5.3$, and implicit AMP alone, $BF_{10} = 5.8$, and with both combined, $BF_{10} = 6.7$ (See *Tables A.5*, *A.6* and *A.7* for all estimates).

4. Conclusions

This study showed that individuals who had implicit preferences for herbal medicines were less likely to show trust in conventional medicine, and that implicit measures were more suited to predict beliefs toward conventional medicine. Moreover, implicit attitudes seemed to predict a greater part of variance over explicit measures when it came to self-reported medication adherence, with the AMP appearing to have a greater predictive value compared to the IAT. These results have been corroborated both by classical frequentist analyses but also by Bayesian models that quantify the degree to which the alternative hypothesis that implicit and explicit measures actually predict beliefs and behaviours is plausible. Overall, the results from the Bayesian analyses were comparable to those obtained with the frequentist analyses.

The implicit AMP seems to be better at predicting self-reported behaviours, while the IAT was useful for predicting more decontextualized beliefs about medicines. This can be explained by the inherent structure of the two measures. While the AMP directly measures an evaluative response toward an object, the IAT provides response to the accessibility of an association in memory, due to its structure (i.e. reaction times on a double categorization task).

The AMP would therefore be more sensitive to 'hot' cognitions, that are more related and predictive of medicine-related behaviours (in the sense that they may be more often associated with the occurrence of behaviours in the individual's life), whereas the IAT would be more sensitive to 'cold' cognitions that are less associated with real behaviours.

In addition, it is possible that the IAT is more sensitive to environmental associations. That is, the IAT might measure knowledge of a positive association with herbal medicines, due to the commonly held belief that herbal medicines are safer because they are natural, but that knowing this does not mean that the individual holds this attitude. This could explain why this measure is relatively uncorrelated to behaviour. Bayesian analyses also provided further evidence that the addition of explicit measures did not help predicting behaviours nor beliefs compared to implicit measures, as evidence by the lack of additional support for the alternative hypothesis in Bayesian analysis for models including explicit measures. Surprisingly, despite a strong correlation between MARS and ProMAS ($r = 0.49$, 95% CI [0.34, 0.62]) and the more favourable measurement properties of the ProMAS relative to the MARS, we found little evidence for ProMAS being associated with any other measure. Further research is required to understand this finding.

Because of its exploratory nature, this study has several limitations. As an observational study, no conclusions on the causal impact of implicit processes on behaviours can be made. Further, due to the tedious nature of completing a large battery of implicit and explicit measures, we opted to sample from a student population. Future studies will need to put in place experimental designs to test specific assumptions about the underlying processes of the tools based on misattribution compared to implicit tools based on reaction times.

We also treated herbal medicine as a homogeneous category, but herbal medicines range from those where there is clear evidence of efficacy, and a demonstrated mechanism of action, through to those that demonstrate no efficacy or mechanism of action. Future research could therefore explore how whether attitudes differ within the herbal medicine category, and further explore the relationship between herbal medicine and other complementary and alternative therapies.

For now, these results demonstrate that CAM use may be driven by 'hot' impulsive cognitions, and that the AMP performs better at measuring attitudes towards herbal medicines/CAM than the IAT. However, these findings need to be confirmed in different populations, and with more ecologically-valid measures of complementary medicine use.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.ctcp.2018.11.006.

References

[1] R. Horne, Representations of medication and treatment: advances in theory and measurement, in: K.J. Petrie, J. Weinman (Eds.), Perceptions of Health and Illness: Current Research and Applications, Harwood Academic, London, 1997, pp. 155–187.
[2] R. Horne, J. Weinman, Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness, J. Psychosom. Res. 47 (6) (1999) 555–567.
[3] F. Strack, R. Deutsch, Reflective and impulsive determinants of social behavior, Pers. Soc. Psychol. Rev. 8 (3) (2004) 220–247.
[4] M. Kleppe, J. Lacroix, J. Ham, C. Midden, A dual-process view on medication adherence: the role of affect, J. Health Psychol. (2017) 1359105317690599.
[5] M. Kleppe, J. Lacroix, J. Ham, C. Midden, 'A necessary evil': associations with taking medication and their relationship with medication adherence, Psychol. Health Med. (2017) 1–7.
[6] J.A. Green, C. Hohmann, K. Lister, R. Albertyn, R. Bradshaw, C. Johnson, Implicit and explicit attitudes towards conventional and complementary and alternative medicine treatments: introduction of an Implicit Association Test, J. Health Psychol. 21 (6) (2016) 927–933.
[7] A.G. Greenwald, D.E. McGhee, J.L.K. Schwartz, Measuring individual differences in implicit cognition: the implicit association test, J. Pers. Soc. Psychol. 74 (6) (1998) 1464–1480.
[8] K. Fiedler, C. Messner, M. Bluemke, Unresolved problems with the "I", the "A", and the "T": a logical and psychometric critique of the Implicit Association Test (IAT), Eur. Rev. Soc. Psychol. 17 (1) (2006) 74–147.
[9] B.K. Payne, D.L. Hall, C.D. Cameron, A.J. Bishara, A process model of affect misattribution, Pers. Soc. Psychol. Bull. 36 (10) (2010) 1397–1408.
[10] B.K. Payne, C.M. Cheng, O. Govorun, B.D. Stewart, An inkblot for attitudes: affect misattribution as implicit measurement, J. Pers. Soc. Psychol. 89 (3) (2005) 277.
[11] B. Gawronski, J. De Houwer, Implicit measures in social and personality psychology, in: H. Reis, C. Judd (Eds.), Handbook of Research Methods in Social and Personality Psychology, second ed., Cambridge University Press, New York, 2014, pp. 283–310.
[12] A.G. Greenwald, B.A. Nosek, M.R. Banaji, Understanding and using the implicit association test: I. An improved scoring algorithm, J. Pers. Soc. Psychol. 85 (2) (2003) 197–216.
[13] B.K. Payne, M.A. Burkley, M.B. Stokes, Why do implicit and explicit attitude tests diverge? The role of structural fit, J. Pers. Soc. Psychol. 94 (1) (2008) 16.
[14] R. Horne, J. Weinman, M. Hankins, The beliefs about medicines questionnaire: the development and evaluation of a new method for assessing the cognitive representation of medication, Psychol. Health 14 (1) (1999) 1–24.
[15] E. Fall, A. Gauchet, M. Izaute, R. Horne, N. Chakroun, Validation of the French version of the Beliefs about Medicines Questionnaire (BMQ) among diabetes and HIV patients, Revue Européenne de Psychologie Appliquée/European Review of Applied Psychology 64 (0) (2014) 335–343.
[16] J. Clatworthy, D. Buick, M. Hankins, J. Weinman, R. Horne, The use and reporting of cluster analysis in health psychology: a review, Br. J. Health Psychol. 10 (3) (2005) 329–358.
[17] K. Thompson, J. Kulkarni, A.A. Sergejew, Reliability and validity of a new medication adherence rating scale (MARS) for the psychoses, Schizophr. Res. 42 (3) (2000) 241–247.
[18] M. Kleppe, J. Lacroix, J. Ham, C. Midden, The development of the ProMAS: a Probabilistic medication adherence scale, Patient Prefer. Adherence 9 (2015) 355–367.
[19] P. Mair, R. Hatzinger, M.J. Maier, T. Rusch, M.P. Mair, Package 'eRm', (2018).
[20] G.-J.Y. Peters, The alpha and the omega of scale reliability and validity, Euro. Health Psychol. 16 (2) (2014) 56–69.
[21] B.K. Payne, O. Govorun, N.L. Arbuckle, Automatic attitudes and alcohol: does implicit liking predict drinking? Cognit. Emot. 22 (2) (2008 Feb 1) 238–271 https://doi.org/10.1080/02699930701357394.
[22] R. Horne, J. Weinman, Self-regulation and self-management in asthma: exploring the role of illness perceptions and treatment beliefs in explaining non-adherence to preventer medication, Psychol. Health 17 (1) (2002) 17–32.