Validation of the Australian/English version of the Diabetes Management Self-Efficacy Scale

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Australians' use of the English language is influenced by a British educational curriculum, exposure to international television programmes and cultural backgrounds. Hence, adapting research instruments for use with Australian populations can be challenging. This study adapted the United Kingdom's version of the 20-item Diabetes Management Self-Efficacy Scale and tested it psychometrically with Australians. Face validity of the adapted instrument was established through consultation with diabetes educators and people with type 2 diabetes. Data from a convenience sample of 88 people with type 2 diabetes were analysed to determine the psychometric properties of the adapted instrument. The results indicate that the Australian/English version of the instrument is internally consistent, stable over time and it measures self-efficacy. However, there was evidence to show that there might be some redundant items in the scale. Further psychometric testing is warranted with a larger sample to determine whether the scale requires refinement.

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INTRODUCTION

Chronic diseases are reaching near-epidemic proportions in the developed world. This is attributed to factors such as an ageing population and poor lifestyle behaviours. Diabetes is the fastest-growing chronic disease of all, and is rapidly becoming a major health issue. More than one million Australians have diabetes and this figure is projected to rise to 1.7 million by 2030.1 The majority (8590%) of these people have type 2 diabetes.2 People with type 2 diabetes are vulnerable to serious complications, including blindness, lower limb amputation, renal and cardiac disease and, as a result, are twice as likely to be admitted to hospital as the general population.2 It is estimated that the direct cost of treating diabetes and its related complications in Australia is almost $A1 billion per annum.3 Thus, reducing the risk of complications is vitally important, not only from a personal, but also, an economic perspective.

Many complications arising from type 2 diabetes are preventable if rigorous attention is paid to managing the disease. Management includes following a prescribed medication regime, monitoring diet and blood glucose levels, doing physical activities, and caring for feet. All of these tasks need to be incorporated into daily living. Therefore, people who are newly diagnosed with the disease require education and assistance to learn the skills that are relevant to the management of their illness. This is particularly important for

older people as they are often at greater risk of complications because of comorbidities.4,5 Adequate management of type 2 diabetes can be difficult to achieve and maintain as people age, however, because of long-established patterns of health behaviour.6,7 Thus, addressing the task-related issues of self-managing diabetes in an environment that fosters behavioural change towards personal health care is vital.

A factor considered to be particularly important to the process of changing self-care behaviour and personal health outcomes is self-efficacy.8,9 The concept of self-efficacy, derived from socialcognitive theory,10 is one in which the behaviour of a person, that person's characteristics and the environment in which the behaviour occurs are constantly interacting. Therefore, a change in one of these factors impacts on the other two. Thus, behavioural, cognitive and social skills must be organized and integrated if a person is to undertake action. A mediating factor in the model is 'efficacy-expectations'. Four significant sources of information influence efficacy-expectations. These are: (i) performance accomplishment (practising and experiencing success in achieving goals); (ii) vicarious experience (observing others perform tasks successfully); (iii) verbal persuasion (receiving positive verbal reinforcement from others); and (iv) self-appraisal (monitoring information about the physical and emotional effects of a specific situation). All influence an individual's efficacy-expectations that, in turn, influence behaviour, which predicts a particular outcome.1012

Self-efficacy is conceptualized by scholars as a global and a domain-specific construct. Those who favour the global model argue that it is an underlying broad sense of personal control that influences decision-making when dealing with challenging situations. Hence, people with a high level of generalized self-efficacy deal more effectively with adversity than those who do not.13,14 The proponents of the global model also acknowledge the widely held view that self-efficacy is domain-specific.10 That is, a person might be self-efficacious towards one particular action (e.g. writing a novel) but not another (e.g. monitoring blood glucose levels). Thus, it is the domain-specific model of self-efficacy that is most suited to underpinning educational interventions aimed at enhancing self-management of type 2 diabetes.

The authors are collaborating with a larger group of researchers, the International Partners in Self-management and Empowerment (IPSE), to undertake a multinational programme of research, supported by self-efficacy theory, which is aimed at achieving global improvement in self-management of type 2 diabetes. The first stage in the programme involves constructing and validating instruments that measure components of a diabetes-specific self-efficacy model. One of these instruments is the Diabetes Management Self-Efficacy Scale (DMSES), which measures efficacy-expectations towards diabetes self-care activities. Originally developed by IPSE partners in The Netherlands,15 the DMSES is being adapted and validated by IPSE researchers at six sites in five countries (Australia, Belgium, Switzerland, United Kingdom (UK) and United States of America (USA)) for use in the second stage of the research programme. This next stage will develop, implement and evaluate a suite of culturally specific educational interventions.

In Australia, the authors adapted the DMSES from the original UK/English version of the instrument developed by Hearnshaw and Sturt (unpubl. data, 2002). The original UK/English version comprises 20 items that assess the extent to which respondents are confident that they can manage their blood glucose level, foot care, medication, diet and level of physical activity. Responses are rated on an 11-point scale anchored with 'Cannot do at all' (0), 'Maybe yes/maybe no' (5) and 'Certain can do' (10). Responses are summed to produce a single score for self-efficacy. Possible scores range from 0200, with higher scores indicating greater self-efficacy. To date, versions of the DMSES have demonstrated

acceptable reliability and validity in Dutch,15 USA16 and UK (Sturt and Hearnshaw, unpubl. data, 2004) populations. This paper describes the adaptation process and preliminary validation of the Australian/English version of the DMSES.

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A two-phased study was undertaken to validate the DMSES for use with Australian populations. Phase I adapted the instrument to the Australian context and vernacular and, in so doing, established face validity. Phase II tested the reliability and validity of the instrument psychometrically. The protocol for the study was approved by the Queensland University of Technology Human Research Ethics Committee and the Princess Alexandra Hospital Human Research Ethics Committee, and was conducted according to the principles outlined in the Declaration of Helsinki.17

Phase I

A convenience sample of 10 diabetes educators, and four patients who met the criteria for eligibility, participated in this phase. The eligibility criteria for patients were:

- Diagnosed with type 2 diabetes
- Aged 18 years
- Self-administering oral medication to control diabetes
- Not cognitively impaired (as determined by nursing or medical report)
- Able to speak and understand English

Senior diabetes educators at four acute-care health institutions in metropolitan Brisbane were contacted and invited to participate in the study. Each of these educators agreed and undertook to recruit all diabetes educators who worked in the relevant institution, plus one eligible patient. Fourteen packages containing a questionnaire that incorporated the UK/English version of the DMSES items, a letter that informed recipients about the purpose of the study, an evaluation form for documenting suggested changes to the layout and wording of questionnaire items and a reply paid envelope were prepared and distributed. The response rate was 100%.

Participants agreed that the layout of the questionnaire was satisfactory. However, as expected, changes to wording so that it better reflected the Australian environment and dialect were suggested. The response descriptor 'Certain can do' was changed to 'Certainly can do'. Three main issues were identified with regard to questionnaire items. The most common suggestion was to change items that referred to exercise. Australians, in general, do not 'take' exercise, they 'do' it, and, increasingly, Australian lifestyle media refer to 'doing physical activity' rather than 'doing exercise'. The second suggestion of note was made by diabetes educators. They expressed concern about the use of the words 'adjust' and 'correct', particularly in relation to medication use. In Australia, people with type 2 diabetes are educated to maintain their regime, which might entail some adjustment in certain situations. It was considered that 'maintain' was a more appropriate word in this context. Similarly, the most appropriate word in Australian English is eating 'plan' rather than eating 'pattern'.

Two of the authors examined the suggestions and recommended that 14 changes be made to the wording of items in the DMSES. These recommendations were accepted by the Australian IPSE partners and are presented in Table 1. The revised instrument is known as the AUS/English version of the DMSES.

Phase II

One-hundred-and-twenty people who met the eligibility criteria described for Phase I were invited to participate in the Phase II study. Sixty-seven people were recruited via advertising, and 65 of these returned completed questionnaires (97%). A further 53 people were identified via a general medical practice. Of these, 25 returned questionnaires (47.2%), giving an overall response rate of 75%. Two of the questionnaires were excluded due to substantial missing data, leaving a total sample of 88 participants. A convenience sample of 32 participants from the 'advertising' group was invited to participate in the retest of the DMSES, and 93.7% responded (n = 30). The characteristics of the participants are presented in Table 2.

Participants were recruited to this study using two methods. The first involved placing advertisements in local newspapers, diabetes-related magazines and websites, and distributing brochures to support groups and community health clinics. Potential participants contacted the investigators and were screened to ensure that they met the research criteria. Packages containing further information about the study, a questionnaire containing the AUS/English version of the DMSES and a reply paid envelope were mailed to eligible participants. At three weeks after the first mail-out, non-respondents were telephoned by one of the investigators. No further contact was made with non-respondents. In the second method, potential participants who met the eligibility criteria were identified by a general medical practitioner from his patient list. Packages prepared by the investigators, as per the protocol for the first method, were addressed and mailed by staff at the practice so as to maintain patient confidentiality.

Potential participants in the retest study undertaken as part of Phase II were those recruited via advertising who returned the initial questionnaire within three weeks. A package containing the AUS/English version of the DMSES, an invitation to complete the questionnaire a second time and a reply paid envelope were mailed to each of these people at three weeks after the first mail-out. This procedure continued until 30 complete questionnaires were received. The characteristics of the retest sample were similar to those of the total sample (see Table 2).

Data were double-entered for verification using SPSS statistical software (SPSS, Chicago, USA) and irregularities were checked with original questionnaires. Missing data were replaced with mean values for the relevant variables. Statistical analyses were undertaken to determine the response distribution, internal consistency, temporal stability and convergent validity of the DMSES.

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Response distribution

Participants' DMSES scores (n = 88) ranged from 62200. The median score of 168 indicated that the data were skewed towards higher self-efficacy, and there was a ceiling effect of 3.4%.

Internal consistency

The DMSES was examined for internal consistency using all available data (n = 88). Cronbach's alpha coefficient for the DMSES = 0.91. The mean-item

correlation = 0.31 (min. = 0.09, max. = 0.96) and the corrected item-total correlations ranged from 0.020.78, with all but five items > 0.40. Removal of these items (1, 7, 18, 19 and 20) made little difference to the alpha coefficient (r = 0.92) but increased the mean-item correlation to 0.46. This suggests that the scale might be more cohesive if these five items are removed.18

An examination of the inter-item correlation matrix for the 20 items revealed five correlation coefficients > 0.80. These were: Items 2 and 3 (r = 0.91); Items 8 and 11 (r = 0.83); Items 13 and 14 (r = 0.96); Items 13 and 15 (r = 0.85); and Items 14 and 15 (r = 0.87). These correlations indicate that there might be some redundancy in the scale.19

Temporal stability

A Pearson's correlation coefficient was calculated to determine the strength of relationship between responses (n = 30) to the DMSES over time, with three weeks between administrations. The result was r = 0.76 (P < 0.001).

Additionally, the level of agreement between responses at both administrations was plotted using a method described by Bland and Altman.20 The level of agreement for each respondent was within 95% confidence estimates, indicating that the DMSES was stable over time. However, the mean difference exceeded zero (M = 4.13, SD = 15.5), suggesting that there might be some bias in the data.

Convergent validity

A valid instrument should measure the underlying construct. In this instance, the DMSES, although domain-specific, should measure the level of a respondent's self-efficacy. In order to examine whether the DMSES is valid in this regard, a measure of generalized self-efficacy, the General Self-Efficacy (GSE) scale, was administered concurrently with the DMSES to a convenience sample of the participants (n = 65).

The GSE is a measure of self-efficacy that was developed in Germany by Schwarzer and Jerusalem.21 The scale comprises 10 items that assess a person's self-efficacy in general situations; for example, 'I can always solve difficult problems if I try hard enough' and 'I can handle whatever comes my way'. The instrument has been adapted to 28 languages and is reported to be internally reliable (alpha coefficients ranging from 0.750.91 across populations from 25 countries).22 It has also been shown to be reliable and valid when tested for convergent and discriminant validity.23 Factor analysis of data from 19 120 participants indicates that the GSE is unidimensional.22

Responses to the DMSES and GSE scale were correlated to assess the strength of relationship. Pearson's correlation between the DMSES and GSE = 0.52 (P < 0.001), which provides some evidence that the DMSES does measure self-efficacy.

The outcomes from this study of the psychometric properties of the AUS/English version of the DMSES suggest that the instrument is appropriate for use with Australians who have type 2 diabetes. Face validity was achieved by engaging with health professionals and patients to ensure that the wording of items in the scale were comprehensible to older Australians, whose early education was influenced by a British curriculum, as well as younger Australians whose use of the English language has been shaped by exposure to American television programmes.

The response distribution for mean DMSES scores tended towards the upper end of the scale. This trend could be explained by the methodology used to recruit participants to the study. The convenience sample was recruited by means of advertisements, brochures and a mail-out to people who had no previous contact with the researchers. It could be argued that only people who are highly self-efficacious will respond to this method. However, the ceiling effect was low and scores for the scale covered a wide spread, so this is unlikely.

The high alpha coefficient suggests that the scale is internally reliable. It is a little higher than that found for the Dutch version of the DMSES15 but similar to coefficients reported for the US/English16 and UK/English versions of the scale (Sturt, pers. comm., 2003). However, the wide spread of mean-item correlations indicates that the scale might not be homogeneous.18 Furthermore, as a number of items were highly correlated, there is a suggestion that there is some redundancy in the scale.19 Factor analysis undertaken with a larger dataset, in conjunction with discussion among the IPSE researchers at the international level as to whether the identified items are integral to the underlying construct, would be useful.

The outcomes of reliability analyses show that the AUS/English version of the DMSES is stable over time, confirming previous analyses of temporal stability in other versions of the instrument15 (and Sturt and Hearnshaw, unpubl. data, 2004). The outcomes revealed a strong relationship between responses at two different administration times and a strong level of agreement between individual responses over time. There was some suggestion of bias as scores tended to be marginally higher at the second administration. This might be attributable to previous knowledge of the questionnaire.

To the best of the authors' knowledge, this is the first time that a version of the DMSES has been tested for convergent validity. This is not surprising given that it is a domain-specific measure of efficacy-expectations and there are few, if any, other such instruments specifically designed for use with people who have type 2 diabetes. The strength of the relationship between the AUS/English version of the DMSES and a measure of generalized self-efficacy provides an indication of the instrument's ability to measure underlying self-efficacy. It remains to be seen if this evidence is confirmed in other studies.

In conclusion, this paper demonstrates that it cannot be assumed that questionnaire items written in English are intelligible to all populations where English is the first language. It also reveals that careful selection of culturally appropriate wording that is faithful to the underlying structure of questionnaire items can produce similar psychometric outcomes when administered across culturally diverse populations. The AUS/English version of the DMSES will be used in the second stage of the IPSE research programme with Australians who have type 2 diabetes. Further psychometric analysis to address the issue of potentially redundant items will be undertaken at that time.

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Image Previews

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Table 1 Comparison of items in the United Kingdom (UK) and Australian versions of the Diabetes Managem...

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Table 2 Characteristics of participants (n = 88)

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