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Title: Negative appraisals of insulin therapy are common among adults with type 2 diabetes using insulin: Results from Diabetes MILES – Australia cross-sectional survey

Running Title: Negative Insulin appraisals among insulin-using type 2 diabetes

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EHT and TCS have no conflicts to declare. FP has acted as an advisory board member and speaker for Novo Nordisk, and as a speaker for Sanofi-Aventis. He has received a grant from Novo Nordisk to support research and he has received funding for travel and accommodation to attend DAWN2 (Diabetes Attitudes Wishes and Needs) International Publication Planning Committee meetings. The Australian Centre for Behavioural Research in Diabetes has received sponsorship for JS to host or attend educational meetings from Lilly, MSD, Novo Nordisk, Roche Diagnostics Australia and Sanofi Diabetes; and has received consultancy income from Roche Diagnostics Australia and Sanofi Diabetes. JS is a member of the Roche Diagnostics Australia Accu-Chek Advisory Board.

Novelty Statement:
- This is the first study to explicitly explore appraisals of insulin therapy among adults with type 2 diabetes currently using insulin using validated measures.
- Despite insulin use, some people with T2DM report negative appraisals of insulin therapy including physical and psychological barriers.
- Diabetes duration, years using insulin, injections and blood glucose checks per do not differ between those with more and those with less negative appraisals of insulin therapy.
- Participants reporting more negative insulin appraisals also report poorer general and diabetes-specific emotional well-being, reduced diabetes-specific self-efficacy and satisfaction with blood glucose levels than those with more positive appraisals.
Abstract

Aims: To identify insulin therapy appraisals among adults with type 2 diabetes using insulin and how negative appraisals relate to clinical, self-care and psychosocial outcomes.

Methods: Diabetes MILES – Australia 2011 was a national survey of adults with diabetes, focused on behavioural and psychosocial issues. Subgroup analyses were conducted on the responses of 273 adults with type 2 diabetes using insulin (46% women; mean±SD age: 59±9 years; diabetes duration: 12±7 years; years using insulin: 4±4). They completed validated measures of insulin therapy appraisals (ITAS), depression (PHQ-9), anxiety (GAD-7), diabetes distress (PAID) and diabetes-specific self-efficacy (DES-SF).

Results: Insulin was perceived to be very important, and its benefits (e.g. improves health) were endorsed by most (82%). Fifty-one percent believed that taking insulin means their diabetes has become worse; 51% that insulin causes weight gain; 39% that they have ‘failed to manage’ their diabetes. Those with the greatest and least ‘ITAS Negative’ scores did not differ by diabetes duration or years using insulin, nor by average number of insulin injections or blood glucose checks per day. Those with more negative insulin appraisals were significantly younger (Mean Diff=5 years, p<0.001), less satisfied with recent blood glucose levels (p<0.001, d=0.63), had reduced diabetes-specific self-efficacy (p<0.001, d=0.7), and were more likely to report depressive symptoms, anxiety, or diabetes distress (all p<0.001, d range=0.65–1.1).

Conclusions: Negative insulin therapy appraisals are common among adults with type 2 diabetes using insulin, and are associated with lower general and diabetes-specific emotional well-being, reduced diabetes-specific self-efficacy and satisfaction with blood glucose.

This manuscript includes data presented at a scientific meeting: Holmes-Truscott E, Skinner TC, Pouwer F, Speight J. Psychological Insulin Resistance In Australians With Type 2 Diabetes Already
Introduction

Beta cell failure generally occurs within 10 years for individuals with type 2 diabetes mellitus (T2DM) [1]. Timely intensification of insulin therapy, and achieving and maintaining optimal HbA1c, significantly reduces the risk of developing or worsening of microvascular complications [2]. ‘Psychological insulin resistance’ describes the negative appraisal of insulin therapy which may act as barrier to insulin initiation or use [3-5]. People with T2DM using insulin report less negative insulin therapy appraisals compared to those not yet using insulin [6-9], leading some to suggest that the experience of insulin mitigates previously perceived barriers to insulin therapy [10]. However, research into insulin omission, or sub-optimal insulin taking, suggest that psychological barriers continue to be of relevance for people with T2DM using insulin [11, 12]. For example, 20% of Americans with T2DM skip their insulin injections ‘often’ or ‘sometimes’, and 46% change their daily activities to avoid additional injections [13]. Insulin omission is significantly associated with treatment dissatisfaction, pain and embarrassment, being younger and requiring a greater number of injections per day [12]. An international study reported common reasons for insulin omission including, stress or emotional problems, embarrassment of injecting in public and the challenge of taking insulin at regular times [11]. The above studies suggest that, for some, negative appraisals and barriers to insulin use persist beyond insulin initiation.

The Insulin Treatment Appraisal Scale (ITAS) [9] measures insulin therapy perceptions among those with T2DM. For those already using insulin, it measures the lived experience of insulin therapy. Previous research with this measure has primarily focused on the insulin appraisals of those not yet using insulin [14, 15]; and on the differences in scores between those using insulin versus those not using insulin, with the former generally displaying significantly lower mean ITAS scores, indicating less negative appraisals [6-9, 16]. However, the variance in ITAS scores commonly reported amongst
adults with T2DM using insulin suggests that a proportion have negative evaluations of insulin therapy equivalent to those of not using insulin.

Few studies have investigated the associations between insulin therapy appraisals and socio-demographic, clinical and psychosocial characteristics in adults with insulin-treated T2DM. To our knowledge, only one study reports on the relationship between mode and duration of insulin injections and negative insulin appraisals using a validated measure [6], and while the association between emotional well-being and perceptions of insulin therapy has been more widely explored among those not using insulin, or where treatment is unspecified [9, 14, 15, 17], no study has reported on these associations specifically among adults with T2DM using insulin.

The aim of the current study is therefore to determine to which extent adults with insulin-treated T2DM experience positive and/or negative aspects of insulin therapy and to investigate whether those who report above average ITAS scores differ from those with lower scores in terms of other psychosocial factors, self-reported clinical factors and self-care behaviours.

**Participants and methods**

The Diabetes MILES Study is an international collaborative exploring the psychosocial aspects of living with diabetes [18, 19]. This study used a selection of data from the Diabetes MILES – Australia 2011 survey, a national cross-sectional survey of adults with type 1 diabetes or T2DM. A detailed description of the methods and overall sample characteristics have been published elsewhere [18]. Diabetes MILES – Australia received ethics approval from the Deakin University Human Research Ethics committee (reference number: 2011-046).

**Participants**

*Survey booklets were posted to a random sample of 15,000 National Diabetes Services Scheme registrants and the survey was also made available nationally online.* Overall, 3,338 eligible
respondents took part, including 1,962 adults with T2DM, of whom 724 (37%) where using insulin (49% (n=953) female; age 59±9 years; diabetes duration 13±8 years). The survey included core measures, asked of all participants, and non-core questions asked in a survey subsets to reduce respondent burden. This analysis includes participants who reported managing their T2DM with insulin injections and completed questionnaires of interest (n=279) (see below).

Measures

Self-reported demographic and clinical characteristics were collected from all participants: age; gender; relationship status; employment status; education level; body mass index (BMI); diabetes duration; years using insulin; presence of diabetes-related complications (yes/no).

Insulin therapy appraisals was measured with the 20-item Insulin Treatment Appraisal Scale (ITAS) [9]. It includes 16 negative, and 4 positive, statements against which respondents indicate their level of agreement (1='strongly disagree' to 5='strongly agree'). Scores are summed to provide an ITAS Negative score (16-80), an ITAS Positive score (5-20) and a total ITAS score (20-100). Our psychometric validation of the ITAS indicated that the negative subscale score is the most robust [16] and, hence, the 'ITAS Negative' score is used here instead of the ITAS total score.

Depressed mood and anxiety were assessed using the 9-item Patient Health Questionnaire-9 (PHQ-9) [20] and 7-item General Anxiety Disorder (GAD-7) questionnaire [21]. For each measure, respondents rate symptom frequency over the past two weeks on a four-point scale (0='not at all' to 3='nearly every day'). Item scores are summed to form a total score (0-27 for PHQ-9; 0-21 for GAD-7). For both, scores of ≥10 indicate moderate-to-severe symptoms.

Diabetes distress was measured using the 20-item Problem Areas in Diabetes Scale (PAID) [22]. Respondents rate the extent to which each issue is a problem for them on a 5-point scale (0='not a problem' to 4='serious problem'). Item scores are summed and standardised to a score out of 100, where scores ≥40 indicate severe diabetes distress.
Diabetes-specific self-efficacy was measured using the 8-item Diabetes Empowerment Scale – short form (DES-SF) [23]. Respondents indicate the extent to which each item is true for them on a 5-point scale (0=‘strongly disagree’ to 5=‘strongly agree’). A composite score (range 0-5) is calculated by summing item scores and dividing by eight.

Self-care behaviours and beliefs were assessed using single items from the Diabetes Self Care Inventory-Revised (DSCI-R) [24]. Participants were asked to indicate the number of injections they require per day, whether they take the required number of injections (1=‘never’ to 5=‘always’), their perceived importance (1=‘not at all’ to 4=‘very’) and the burden associated with these injections (1=‘not at all’ to 4=‘a great burden’). Due to little variance in responses, these three categorical variables were dummy coded to represent optimal versus sub-optimal responses, with the former equating to ‘always’ taking insulin as recommended, considering it ‘very’ important, or ‘not at all’ a burden. Participants also recorded the average number of blood glucose checks performed per day, and satisfaction with their blood glucose levels (0=‘very dissatisfied’ to 6=‘very satisfied’), over the past two weeks.

Statistical analysis

Participants with >1 missing value on the ITAS (n=6) were excluded. According to scale guidance, missing datapoints were replaced with participants’ summed mean scores (for the PAID, if ≤2 items were missing, and for the ITAS, PHQ9 and GAD7, when only one item was missing). Missing data were not replaced for other variables. Valid percentage is used throughout.

Statistical analysis was undertaken using SPSS version 21 (Chicago, USA). Univariate differences between groups were assessed student’s t-tests (for continuous variables) and chi-squared tests (for categorical variables). Participants who reported negative ITAS scores within the first or fourth quartile were compared on demographic, clinical, self-care and psychosocial variables. Results are
reported as mean±SD or % (n). All statistical tests were two-sided and differences were accepted as significant at \( p < 0.05 \).

Results

A sample of 273 adults with T2DM using insulin injections completed the ITAS, with no more than one missing value (n=6). Table 1 displays demographic, clinical and psychological characteristics of the sample.

The mean ITAS Positive score was high overall (14.9±2.6), with three of the four positive items being endorsed by ≥75% of the sample. The mean ITAS Negative score was 41.4±9.7. The mean number of negatively worded ITAS items endorsed (‘agree’ or ‘strongly agree’) by participants was 4±3, with 27 (9.9%) participants endorsing no barriers and one individual endorsing all 16. The most commonly endorsed negative aspects of insulin use concerned weight gain and condition progression (n=140, 51.3% for both).

To characterise how participants reporting most and least negative insulin appraisals differed, the upper quartile (UQ; ≥48) and lower quartile (LQ; ≤36) of ITAS Negative were examined. The mean ITAS Positive score did not significantly differ between groups.

Table 2 displays the total sample and percentage of participants in the UQ and LQ who agreed or strongly agreed with each ITAS item, ranked in descending order according to the UQ group. Table 2 also displays the percentage difference in item endorsement between groups, i.e. item discrimination. Each of the 16 negative items was more highly endorsed by the UQ group and each of the four positive items was more highly endorsed by the LQ group. While the degree of endorsement is different between groups, similar trends in item rankings were apparent. For example, five of the top six most endorsed ITAS Negative items for each group were the same. “Insulin means my diabetes has become much worse” was the most commonly endorsed ITAS
Negative item among those in the UQ, while “Insulin causes weight gain” was the most commonly endorsed ITAS Negative item among LQ respondents. The item that discriminates best between UQ and LQ is “insulin makes life less flexible”, with a 61% difference in endorsement between groups.

As seen in Table 1, UQ and LQ groups did not differ substantially on any demographic variables except age ($t=(148)3.5, p=0.001, d=0.57$) and employment ($\chi^2=(1) 6.2, p=0.013, d=0.46$), where participants reporting more negative insulin appraisals were younger and more likely to be in paid employment.

Regardless of ITAS scores, participants took approximately two injectioned insulin approximately twice per day and the majority felt that it was ‘very important’ to take all of their recommended daily injections. However, participants reporting greatest negative insulin appraisals (UQ) were significantly more likely to report taking their required daily insulin injections ($\chi^2=(1)5.17, p=0.023, d=0.39$) and that taking these injections were at least somewhat of a burden ($\chi^2=(1)46.99, p<0.001, d=1.4$) compared to the LQ group. **While there was no significant difference in duration of insulin use (years) between groups, more participants in the UQ group had been using insulin for ≤1 year compared to the LQ group (39.6% vs 16.4%; $\chi^2=(1)7.40, p=0.007, d=0.54$).** Participants reported a similar frequency of self-monitoring of blood glucose (SMBG) per day over the past two weeks, but the UQ group were significantly less satisfied with their blood glucose levels than the LQ group ($t=(148) 3.9, p<0.001, d=0.63$).

Participants reporting greatest ITAS Negative appraisals displayed significantly lower diabetes-specific self-efficacy than those in the LQ ($t (144)=4.2, p<.001,d=0.73$). The UQ reported significantly lower mean item scores, compared to those in the LQ ($p=.012$ to <.001; $d=0.42$ to 0.91), except for item 1: “I know what parts of taking care of my diabetes I am dissatisfied with” (Mean Diff= -0.116, $t (144.41)=-0.597, p=0.551$), and item 8: “I know enough about myself as a person to make diabetes care choices that are right for me” (Mean Diff=0.2, $t (148)=1.9, p=0.056$).
Participants reporting more negative insulin appraisals (UQ) reported significantly more depressive symptoms ($t(144)=-4.5, p<0.001, d=0.74$) and anxiety symptoms ($t(143)=-4.0, p<0.001, d=0.66$) than those with the least negative appraisals (LQ). Half (n=40, 54.4%) of UQ participants reported moderate-to-severe depressive and/or anxiety symptoms compared to 28.6% (n=22) in the LQ group. Participants in the UQ also reported significantly greater diabetes distress than those in the LQ ($t(112.5)=-6.4, p<0.001, d=1.07$). Of those participants in the UQ, 42.4% (n=28) reported severe diabetes distress compared to 8.9% (n=7) of those in the LQ.

Discussion

**Negative** Our findings demonstrate that negative appraisals of insulin therapy are evident among adults with insulin-treated T2DM. Furthermore, those who report more negative experiences of insulin therapy are also more likely to report poorer general emotional wellbeing, greater diabetes distress, lower diabetes-specific self-efficacy and less satisfaction with blood glucose levels.

**Consistent with other studies** [6, 7, 9], our findings suggest that negative insulin therapy appraisals may persist beyond insulin initiation, and may need to be evaluated as part of ongoing holistic diabetes care, particularly where concerns exist regarding other diabetes outcomes.

While, on average, people with T2DM currently using insulin hold significantly less negative insulin appraisals than those not using insulin [6, 7, 9, 16], only 10% of the current sample did not experience any barrier regarding insulin therapy. Further, as previously reported [16], this sample did not report significantly higher ITAS Positive scores than Australian adults with non-insulin-using T2DM. The most highly endorsed negative appraisals are similar between groups, with two exceptions. ‘Insulin causes weight gain’ (item 9) was the most endorsed negative aspect of insulin use among the LQ ITAS group. For the UQ group, four other aspects to insulin use were perceived to be more problematic than weight gain. ‘Insulin makes life less flexible’ (item 5), ranked second for the UQ group but eighth for the LQ group, making it the item which discriminated most strongly
between the two groups. Given that UQ participants were younger and more likely to be in paid employment, it is unsurprising that insulin is perceived to be a greater inconvenience to these participants.

Previous studies have reported inconsistent results regarding the association of demographic characteristics and insulin appraisals amongst people with T2DM. Where a significant association has been reported, those with greater negative appraisals were consistently more likely to be women [e.g. 25, 26-28] and less educated [e.g. 6, 29]. However, participants with greatest and least negative appraisals in the current study did not differ significantly by gender or education. Nor did the two groups differ according to clinical characteristics: BMI, diagnosis of diabetes-related complications, diabetes duration.

With regard to diabetes self-care, no significant between group differences were apparent in the average number of years using insulin, number of insulin injections per day, or frequency of SMBG per day over the past two weeks. When years using insulin therapy was categorised as ≤ or >1 year there was a significant difference between groups, with a greater number of UQ participants having started insulin therapy within the past year. This contrasts with the findings of a Chinese outpatient study. Similarly, Chen et al [6] reported that the total ITAS scores of a sample of Chinese outpatients did not significantly differ between those using insulin for ≤1 year compared to >1 year. Further, the majority of participants (regardless of ITAS quartile) had been using insulin for more than one year. This supports the idea that, for some, insulin therapy appraisals do not change radically after initiation of insulin therapy or may even increase with greater experience of using insulin.

Psychological barriers to insulin therapy have been reported as associated with, or a reason for, insulin omission [11, 12], while optimal medication-taking behaviours are reportedly associated with belief in the benefit of the medication [30]. In contrast, participants reporting greatest negative
appraisals of insulin therapy in the current study were actually more likely to report 'always' taking their injections as recommended, compared to those with less negative ITAS scores; and the vast majority of the sample reported that taking their insulin as recommend was very important and endorsed the benefits of insulin use. This suggests that negative insulin appraisals may be, at least in part, independent of beliefs in the benefits of insulin use [16]. Further, negative insulin appraisals alone do not appear to influence actual insulin-taking behaviour and investigation into the behavioural consequences of negative insulin appraisals is warranted.

Participants reporting greatest negative appraisals of insulin (UQ) were significantly less satisfied with their blood glucose levels over the past two weeks than those reporting least negative appraisals (LQ). Furthermore, UQ participants reported lower diabetes-specific self-efficacy than those in the LQ but reported a similarly high belief that they knew which parts of their diabetes they were dissatisfied with (DES-SF item 1). It may be that participants with greatest negative appraisals are less satisfied as a result of their diabetes management due to not seeing the expected improvements in blood glucose levels following insulin initiation that might have been expected; that is, and participants may feel unrewarded for their efforts in undertaking a more demanding treatment regimen. The assessment of insulin appraisals may provide an indicator of whether the insulin type or dosage needs to be reconsidered to improve not only blood glucose levels but also treatment satisfaction. However, it is beyond the scope of the current study to assess the longitudinal relationship between insulin therapy appraisals and satisfaction with diabetes management, and we do not have HbA1c data with which to further examine this relationship.

Participants with greatest negative insulin appraisals (UQ) were also more likely to report depressive symptoms, anxiety symptoms and diabetes distress than participants in the LQ. One possible explanation for this is that those who generally have a more negative demeanour or mood may be more susceptible to negative beliefs, whether it be about insulin, blood glucose levels or life in general. Given the cross-sectional nature of this study we are unable to make a determination and it
is unclear whether poor emotional wellbeing (general or diabetes-related) preceded insulin use or may be more directly connected to the negative experience of insulin use. However, one third of participants with greatest negative appraisals (UQ) did not report elevated levels of depressive symptoms, anxiety symptoms or diabetes distress. It is more likely that a combination of the above (i.e. presence of emotional distress and dissatisfaction with blood glucose outcomes) is intertwined with this group’s lack of physical adjustment (to the side effects and inconvenience) and psychological adjustment (“I’m sicker now”) to insulin use. Assessment of insulin appraisals and intervention may improve treatment satisfaction and indirectly improve diabetes-specific and general emotional wellbeing. Unlike depression, which may require referral to a mental health specialist, insulin therapy appraisals may be suitably assessed and addressed within the diabetes care setting by healthcare professionals.

There are a number of limitations of... The Diabetes MILES – Australia study has several limitations, which are detailed elsewhere [18]. Of particular relevance to the current analysis is the lack of HbA1c data, which would have been useful for investigating the impact of negative appraisals of insulin on an indicator of complication risk (i.e. diabetes outcome). Furthermore, the cross-sectional nature of the study means that causality cannot be determined. In addition, the self-care data collected (e.g. insulin-taking behaviours) were all uncorroborated self-report using single items from a new self-care measure (in development). Finally, to undertake a comparative analysis of those with greatest and least negative insulin appraisals, continuous ITAS Negative scores were categorised and only the extreme upper and lower according to quartiles were included, with the middle two quartiles (half the sample \( n=123 \)) discarded from analysis. This does not, however, appear to have diminished the power of our study nor artificially inflated relationships. Supplementary analysis (data not reported), using the whole sample, confirmed significant associations between ITAS Negative scores (as a continuous variable) and the demographic, clinical and psychosocial variables shown to be significant in table 1.
Conclusion

Negative appraisals of insulin therapy are evident among adults with T2DM currently using insulin. Previous research has focused on negative appraisals among people with non-insulin-treated T2DM with an (unwritten) implication that insulin initiation represents overcoming those barriers. Our data suggest that this view is flawed. More negative appraisals of insulin are associated with poorer emotional wellbeing (general and diabetes-specific) and lower diabetes self-efficacy. While greater negative appraisals do not appear to be related to sub-optimal insulin-taking behaviours, they are associated with reduced satisfaction with blood glucose levels, and this marker of disappointment with the efforts required by a more intensive diabetes treatment regimen needs to be further explored. Prospective studies are needed to examine the associations between negative appraisals of insulin before and after insulin initiation and the extent to which these may affect insulin-taking behaviours, HbA1c and emotional distress.
References


Table 1. Demographics, clinical and psychosocial characteristics of the total sample and between group differences.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total sample</th>
<th>ITAS Negative score</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=273</td>
<td>Lower Quartile n=79</td>
<td>Upper Quartile n=71</td>
</tr>
<tr>
<td>Age: years</td>
<td>58.7±8.7</td>
<td>60.3±8.2</td>
<td>55.0±10.2</td>
</tr>
<tr>
<td>Gender: women</td>
<td>46.2% (126)</td>
<td>45.6% (36)</td>
<td>49.3% (35)</td>
</tr>
<tr>
<td>Employment: in paid work</td>
<td>29.1% (178)</td>
<td>67.1% (51)</td>
<td>73.5% (50)</td>
</tr>
<tr>
<td>Education: ≥ high school</td>
<td>73.1% (196)</td>
<td>73.3% (55)</td>
<td>73.2% (52)</td>
</tr>
<tr>
<td>Relationship status: with partner / married</td>
<td>73.1% (196)</td>
<td>73.3% (55)</td>
<td>73.2% (52)</td>
</tr>
<tr>
<td>Diabetes duration: years</td>
<td>12.5±7.5</td>
<td>11.9±6.9</td>
<td>11.5±6.7</td>
</tr>
<tr>
<td>Years using insulin</td>
<td>4.1±4.2</td>
<td>4.1±3.6</td>
<td>3.6±4.3</td>
</tr>
<tr>
<td>Diabetes-related complications: ≥1</td>
<td>54.6% (149)</td>
<td>55.7% (44)</td>
<td>43.7% (31)</td>
</tr>
<tr>
<td>Body mass index</td>
<td>34.1±8.9</td>
<td>33.2±7.1</td>
<td>33.2±9.1</td>
</tr>
<tr>
<td>Insulin injections: N per day</td>
<td>2.2±1.2</td>
<td>2.2±1.3</td>
<td>2.4±1.2</td>
</tr>
<tr>
<td>Insulin injections: ‘almost) always’ take required injections each day</td>
<td>77.7% (202)</td>
<td>69.7% (53)</td>
<td>85.9% (55)</td>
</tr>
<tr>
<td>Insulin injections: considered ‘very important’</td>
<td>82.5% (217)</td>
<td>80.5% (62)</td>
<td>82.8% (53)</td>
</tr>
<tr>
<td>Insulin injections: considered ‘not at all a burden’</td>
<td>61.6% (162)</td>
<td>87% (67)</td>
<td>30.8% (20)</td>
</tr>
<tr>
<td>Self-monitoring of blood glucose: average N checks per day over last 2 weeks (0-7+)</td>
<td>2.63±1.51</td>
<td>2.9±1.5</td>
<td>2.5±1.5</td>
</tr>
<tr>
<td>Satisfaction with blood glucose levels over last 2 weeks (0=very dissatisfied to 6=very satisfied)</td>
<td>3.49±1.72</td>
<td>4.1±1.7</td>
<td>2.97±1.7</td>
</tr>
<tr>
<td>Insulin appraisal: ITAS negative score (16-80)</td>
<td>41.4±9.7</td>
<td>30.1±5.1</td>
<td>53.2±5.9</td>
</tr>
<tr>
<td>Insulin appraisal: ITAS positive score (5-20)</td>
<td>14.9±2.6</td>
<td>14.9±3</td>
<td>14.4±2.6</td>
</tr>
<tr>
<td>Depressive symptoms: PHQ-9 (0-27)</td>
<td>7.7±6.27</td>
<td>5.8±5.5</td>
<td>10.12±6.1</td>
</tr>
<tr>
<td>Anxiety symptoms: GAD-7 (0-21)</td>
<td>5.1±5.2</td>
<td>3.8±4.5</td>
<td>7.0±5.3</td>
</tr>
<tr>
<td>Diabetes distress: PAID (0-100)</td>
<td>24.9±20.5</td>
<td>15.3±15.5</td>
<td>36.3±22.4</td>
</tr>
<tr>
<td>Diabetes self-efficacy: DES-SF (0-5)</td>
<td>3.7±.7</td>
<td>3.9±.6</td>
<td>3.5±.6</td>
</tr>
</tbody>
</table>

NB: data are M±SD or %(n). Valid percentages reported due to missing varied Ns for each questionnaire.
Complications count includes kidney damage, albuminuria, retinopathy, neuropathy, heart disease, stroke and vascular disease.
DES-SF= Diabetes Empowerment Scale – Short Form; GAD-7=Generalised Anxiety Disorder questionnaire; ITAS=Insulin Treatment Appraisal Scale; PAID=Problem Areas In Diabetes Questionnaire; PHQ-9=Patient Health Questionnaire
Table 2. Endorsement of ITAS items overall and by quartile group in descending order according to the upper quartile.

<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Lower Quartile (%)</th>
<th>Upper Quartile (%)</th>
<th>Percentage Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITAS Negative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Taking insulin means my diabetes has become much worse</td>
<td>30.4</td>
<td>73.2</td>
<td>-42.8</td>
</tr>
<tr>
<td>5</td>
<td>Taking insulin makes life less flexible</td>
<td>5.1</td>
<td>66.2</td>
<td>-61.1</td>
</tr>
<tr>
<td>1</td>
<td>Taking insulin means I have failed to manage my diabetes with diet and tablets</td>
<td>24.1</td>
<td>59.2</td>
<td>-35.1</td>
</tr>
<tr>
<td>7</td>
<td>Taking insulin increases the risk of low blood glucose levels (hypoglycaemia)</td>
<td>17.7</td>
<td>59.2</td>
<td>-41.5</td>
</tr>
<tr>
<td>18</td>
<td>Being on insulin causes family and friends to be more concerned about me</td>
<td>15.2</td>
<td>57.7</td>
<td>-42.5</td>
</tr>
<tr>
<td>9</td>
<td>Insulin causes weight gain</td>
<td>44.3</td>
<td>56.3</td>
<td>-12</td>
</tr>
<tr>
<td>4</td>
<td>Taking insulin means other people see me as a sicker person</td>
<td>7.6</td>
<td>53.5</td>
<td>-45.9</td>
</tr>
<tr>
<td>20</td>
<td>Taking insulin makes me more dependent on my doctor</td>
<td>16.5</td>
<td>53.5</td>
<td>-37</td>
</tr>
<tr>
<td>13</td>
<td>Taking insulin is embarrassing</td>
<td>2.5</td>
<td>43.7</td>
<td>-41.2</td>
</tr>
<tr>
<td>14</td>
<td>Injecting insulin is painful</td>
<td>1.3</td>
<td>43.7</td>
<td>-42.4</td>
</tr>
<tr>
<td>10</td>
<td>Managing insulin injections takes a lot of time and energy</td>
<td>2.5</td>
<td>40.8</td>
<td>-38.3</td>
</tr>
<tr>
<td>15</td>
<td>It is difficult to inject the right amount of insulin correctly at the right time every day</td>
<td>3.8</td>
<td>31</td>
<td>-27.2</td>
</tr>
<tr>
<td>12</td>
<td>Taking insulin means my health with deteriorate</td>
<td>0</td>
<td>28.2</td>
<td>-28.2</td>
</tr>
<tr>
<td>6</td>
<td>I'm afraid of injecting myself with a needle</td>
<td>1.3</td>
<td>25.4</td>
<td>-24.1</td>
</tr>
<tr>
<td>16</td>
<td>Taking insulin makes it more difficult to fulfil my responsibilities (at work, at home)</td>
<td>0</td>
<td>21.2</td>
<td>-21.2</td>
</tr>
<tr>
<td>11</td>
<td>Taking insulin means I have to give up activities I enjoy</td>
<td>0</td>
<td>14.1</td>
<td>-14.1</td>
</tr>
<tr>
<td>ITAS Positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Taking insulin helps to improve my health</td>
<td>77.2</td>
<td>73.2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Taking insulin helps to prevent complications of diabetes</td>
<td>78.5</td>
<td>70.4</td>
<td>8.1</td>
</tr>
<tr>
<td>17</td>
<td>Taking insulin helps to maintain good control of my blood glucose</td>
<td>82.3</td>
<td>70.4</td>
<td>11.9</td>
</tr>
<tr>
<td>19</td>
<td>Taking insulin help to improve my energy levels</td>
<td>36.7</td>
<td>23.9</td>
<td>12.8</td>
</tr>
</tbody>
</table>
NB: Endorsement is defined as selecting the ‘agree’ or ‘strongly agree’ response option. Percentage difference is defined as Lower Quartile minus Upper Quartile