The Effect of Experiential Learning on Psychological Insulin Resistance Improvement in Patients With Type 2 Diabetes

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BACKGROUND

- Insulin therapy is important to control high blood glucose;
- Early initiation of insulin would present better glycemic control and reducing the risk of complications

While reluctance existed in patients to start insulin therapy
BACKGROUNDS

Psychological Insulin Resistance (PIR)

WHAT IS PIR?

• The reluctance to initiate insulin therapy
• It was named by Leslie in 1994
• Existed in both patients and physicians

In 2005, DAWN study in 13 countries (Asia, Australia, Europe, and North America)

- patients with T2DM not taking insulin (n=2061)
- diabetes care providers (nurses=1109; physicians=2681)

More than half of patients who had never used insulin expressed anxiety about starting insulin therapy.
Dominating factors related to PIR:

- Family economic
- Severity of diabetes
- Attitude toward hypoglycemia
- Concerns on insulin injection skill
- Fears of pain
- Concerns on gain weight, etc

Inadequate knowledge in insulin and insulin injection

Experiential learning (EL) theory

- Developed by David Kolb in the 1970s;
- Based on THREE theories:
  - Experience learning of John Dewey
  - Group dynamics theory of Kurt Lewin
  - Genetic epistemology of Jean Piaget
1) Concrete experience: where the topic is approached through personal involvement;
2) Reflective observation: where the topic is evaluated through varying perspectives;
3) Abstract conceptualization: where the topic is analyzed through logic and planning;
4) Active experimentation: where understanding of the topic is influenced through participation and testing.
The application of EL theory:

Important teaching method in:

- School teaching
- Clinical teaching for medical students
- ...

Favorable effects have been received in the studies ABOVE
● We are aiming to apply EL theory to the education for patients with type 2 diabetes.

● To determine the influence of education based on EL theory on PIR in patients with type 2 diabetes.
Ethical considerations

In accordance with the ethical committee of the fifth people’s hospital of Shanghai, Fudan university

Formal written consent by participants
Study design

- It is a quasi-experimental study;
- Convenience sample method;
- It was conducted in the endocrinology department of the fifth people’s hospital of Shanghai, Fudan University;
- Experimental group (EG) : June, 2013 to February, 2014;
- Control group (CG) : March to October, 2014.
Study participants

**Inclusion criteria**

- Medical diagnosed of type 2 diabetes;
- Without insulin injections’ history before;
- Need insulin injection after discharged and do the injection by themselves;
- Fully cognitive and behavioral ability;
- Express willingness to participate.

**Exclusion criteria**

- Gestational diabetes mellitus or women planning to have a baby recently;
- Patients intent to go out for a long time (nearly 1-2 months);
- Patients with severe diabetes complications and comorbidities, diabetic ketoacidosis, stroke, myocardial infarction, or malignancy, etc.
The sample size calculation was based on the pilot of this study.

A clinically relevant difference of 16.8% for the change in incidence of PIR in the experimental group was obtained.

20% more patients will be recruited in each group.

Finally, 200 patients in each group gave 90% power at an α level of 0.05 to confirm the benefits of health education based on experiential learning theory on incidence of PIR.
METHODS

Intervention

Four nurses in endocrinology department were needed to do the intervention:

- More than five years working experience in endocrinology department;
- Excellent communication and expression skills.
**METHODS**

**Intervention contents**

- Watching a short video about the insulin injection;
- Health education on diabetes and insulin injection;
- After hospital discharged, patients will be invited to the weekly diabetes health education center in the outpatient.

**Control group**

**Routine health education**
Methods

Intervention contents

Experimental group

A specialized box for insulin injection (SBFII)

The box was placed on the bedside stands
The box can be used to place the insulin pen and other materials related to insulin injection.
Patients’ general information, insulin species, frequency and dosage were written on the surface of the box.
METHODS

Intervention contents

A paper which drawn the steps of insulin injection were paste inside.
METHODS

**Intervention contents**

*Application of the EL theory*

**Step one**

*Theory-study: the first day of hospital admission*

- Explain the details about insulin and insulin injection;
- Do the insulin injection for the patients as an example.

**Step two**

*Concrete experience: the next three days*

- Supervise the patients do the insulin injection by themselves;
- Point out the inaccurate details;
- Tell the correct methods again.
Reflective observation: The fifth day
- Launch a group session on a small scale of patients (primary topic of the group session was the insulin injection skills);
- The patients can express their views.

Abstract conceptualization: the day of hospital discharge
- Patients were asked to describe the key points of insulin injection
- Summary all the mistakes they have made;

Active experimentation: Days after hospital discharge
- Monthly group session related to insulin injection skills education
- Patients are the main speakers.
METHODS

Outcomes

The Insulin treatment attitude scale (ITAS)

- Developed by Xiaoying Ding;
- Consisted of 20 items that covered 3 dimensions;
- Responses for each item ranged from 1 (strongly disagree) to 5 (strongly agree);
- Total scores ranged from 20 to 100, a PIR would be regarded if total scores >60;
- Good internal consistency: Total Cronbach's alpha coefficient was 0.88, Cronbach's alpha coefficient for each dimension ranged from 0.67 to 0.76
METHODS

Outcomes

Incidence of PIR

The digital assessment scale

- Designed by the member of our research team;
- Can be used to evaluate patients’ willingness to insulin injection.
- There are only 11 numbers (ranged from 0 to 10) on the scale, which represent score 0 (strong unwillingness) to 10 (strong willingness).
- Patients can express their willingness to insulin injection by pointing the figure.

Willingness of insulin injection

HbA₁C level
Willingness of insulin injection

• HbA₁C level was collected from clinical records;
• Blood specimens for HbA₁C assessment were taken by practice staff in the department of clinical laboratory, they were blinded to patient group allocation.
Data collection

- Data were collected at baseline and 3 months later for both groups.
- The data of baseline, including demographic information, incidence of PIR, willing score of insulin injection and HbA$_1$C level were collected after admission in the wards.
- On the day of discharge, the researcher told all the participants to go to the demonstration classroom of our department three months later to complete the questionnaires and HbA$_1$C assessment.
Statistics

• SPSS 22.0 software were used;

• Dichotomous and ordinal variables were examined using chi-square tests.

• Normal distribution and homogeneity of variance were examined before the statistical analysis for continuous measures, then independent t test or rank sum test would be used.

• Baseline clinical and demographic data of the intervention groups were compared to assess the effect of intervention.

• $P$-values of less than 0.05 were considered as significant (two tailed).
RESULTS

Recruitment

- There were a total of 1124 potentially eligible patients, 60.6% (n=681) did not meet the inclusion criteria.

- Of the 443 eligible patients, 9.7% (n=43) declined to participate, the rest 400 were consented and allocated into EG (n=200) and CG (n=200).

- Of the 400 allocated patients, 388 successfully completed data analysis at 3 months.
# Baseline characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>EG (n=193)</th>
<th>CG (n=195)</th>
<th>x²/t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender [n(%)]</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Male</td>
<td>109 (56.48%)</td>
<td>10 (51.79%)</td>
<td>0.856</td>
<td>0.355</td>
</tr>
<tr>
<td>Female</td>
<td>84 (53.52%)</td>
<td>94 (48.21%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age (M±SD)</strong></td>
<td>58.66±10.30</td>
<td>60.36±11.60</td>
<td>1.521</td>
<td>0.129</td>
</tr>
<tr>
<td><strong>Education [n(%)]</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Primary school or below</td>
<td>32 (16.58%)</td>
<td>29 (14.87%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle school</td>
<td>140 (72.54%)</td>
<td>14 (73.85%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>College or above</td>
<td>21 (10.88%)</td>
<td>22 (11.28%)</td>
<td>0.271</td>
<td>0.897</td>
</tr>
<tr>
<td><strong>Occupation [n(%)]</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Employed</td>
<td>61 (31.61%)</td>
<td>58 (29.74%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>22 (11.40%)</td>
<td>14 (7.18%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retired</td>
<td>110 (56.99%)</td>
<td>123 (63.08%)</td>
<td>2.568</td>
<td>0.277</td>
</tr>
<tr>
<td><strong>Marriage [n(%)]</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmarried</td>
<td>16 (8.30%)</td>
<td>28 (14.36%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>177 (91.70%)</td>
<td>167 (85.64%)</td>
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</tbody>
</table>
### Effectiveness of the intervention

**Outcomes at baseline and 3 months in EG and CG**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Group</th>
<th>Baseline [n(%)]/ Mean(min, max)</th>
<th>SD</th>
<th>3-month [n(%)]/ Mean(min, max)</th>
<th>SD</th>
<th>Difference [n(%)]/ Mean (95%CI)</th>
<th>$x^2$ (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incidence of PIR[n(%)]</strong></td>
<td>EG</td>
<td>118 (61.1%)</td>
<td>-</td>
<td>86 (44.5%)</td>
<td>-</td>
<td>-32 (-16.6%)</td>
<td>10.65 (0.001)*</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>124 (63.5%)</td>
<td>-</td>
<td>131 (67.1%)</td>
<td>-</td>
<td>7 (3.6%)</td>
<td>0.555 (0.46)</td>
</tr>
<tr>
<td><strong>Willing score of insulin injection</strong></td>
<td>EG</td>
<td>7.58 (2.0, 10.0)</td>
<td>1.70</td>
<td>9.62 (2.0, 10.0)</td>
<td>0.71</td>
<td>2.04 (1.85, 2.22)</td>
<td>191.53 (0.000)*</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>7.29 (2.0, 10.0)</td>
<td>2.22</td>
<td>7.48 (2.0, 10.0)</td>
<td>1.76</td>
<td>1.11 (0.96, 1.26)</td>
<td>0.11 (0.74)</td>
</tr>
<tr>
<td><strong>HbA$_1$C(%)</strong></td>
<td>EG</td>
<td>7.59 (5.5, 11.0)</td>
<td>1.28</td>
<td>7.09 (5.5, 9.2)</td>
<td>0.84</td>
<td>-0.5 (0.59, -0.41)</td>
<td>13.33 (0.000)*</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>7.48 (6.3, 10.9)</td>
<td>0.92</td>
<td>7.25 (6.0, 9.5)</td>
<td>0.62</td>
<td>-0.23 (-0.3, -0.16)</td>
<td>3.38 (0.07)</td>
</tr>
</tbody>
</table>

*: p<0.05, significant difference
### Effectiveness of the intervention

**Differences between EG-CG at 3 months in the outcomes**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Difference (mean)</th>
<th>95%CI</th>
<th>x^2 (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence of PIR</td>
<td>-</td>
<td>-</td>
<td>20.13(0.000)*</td>
</tr>
<tr>
<td>Willing score of insulin injection</td>
<td>2.14</td>
<td>1.87, 2.41</td>
<td>172.61(0.000)*</td>
</tr>
<tr>
<td>HbA_1C(%)</td>
<td>-1.59</td>
<td>-0.31, -0.01</td>
<td>4.84(0.028)*</td>
</tr>
</tbody>
</table>

*: p<0.05, significant difference
DISCUSSION

Patients had a strong demand for insulin knowledge

• Incomprehension on the effectiveness of insulin
• Difficulty in learning insulin injection skills
• Fears of pain

Shortage of education for patients in clinical work

• Nurses in practical work ignored psychological problems from patients
• Elderly patients could hardly remember clearly the issues they were taught.
• Feedback about the education could hardly got by educators.
DISCUSSION

*EL theory*

- Emphasizes an individual to form their personalized understanding of specific knowledge
- Verify the understanding in the experience and apply them to solve problems in practical work
- According to the continuous practice on insulin injection, patients had a better comprehension on diabetes.
- Good comprehension stimulated patients’ resonance on diabetes self-management, led to skilled insulin injection and reduced fear for pain
CONCLUSIONS

The intervention of experiential learning theory significantly reduced the incidence of PIR, improved the willing score of insulin injection, reduced the HbA1C level in patients with type 2 diabetes.

The results of this study provide a new idea for the health education in patients with diabetes in the future.
THANK YOU!

Nursing School of Fudan University