Is vocational training failing to prepare fitness students for employment and future study?

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What is a misconception?

- We rely on a number of heuristics and biases when processing new information.
- An example is confirmation bias.
- This can lead to misconceptions, persistent ideas not supported by current scientific views.

Sources of misconceptions

## Sources of misconceptions

<table>
<thead>
<tr>
<th>Pedagogic</th>
<th>Ontological</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inaccurate visual representation used as teaching aids</td>
<td>Personal experience</td>
</tr>
<tr>
<td>Ambiguous language</td>
<td></td>
</tr>
<tr>
<td>Poor analogies by lecturers or texts</td>
<td>The media</td>
</tr>
<tr>
<td>A classroom model not being applied universally</td>
<td></td>
</tr>
</tbody>
</table>
The history of ‘spot reduction’


This dissipation of fat is local; that is to say, it disappears in localities in which muscles are active, and in proportion to their activity. Thus people will accumulate fat in accordance very largely with their personal habits. Peo-
The history of ‘spot reduction’

<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
<th>Measurement</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>Culbertson</td>
<td>Dissection</td>
<td>X</td>
</tr>
<tr>
<td>1931</td>
<td>Buchwald &amp; Cori</td>
<td>Dissection</td>
<td>✓</td>
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<tr>
<td>1960</td>
<td>Carns et al.</td>
<td>Hydrodensitometry</td>
<td>X</td>
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<tr>
<td>1962</td>
<td>Roby</td>
<td>Skinfold</td>
<td>X</td>
</tr>
<tr>
<td>1962</td>
<td>Schade et al.</td>
<td>Photography</td>
<td>X</td>
</tr>
<tr>
<td>1965</td>
<td>Mohr</td>
<td>Skinfold, girth</td>
<td>✓</td>
</tr>
<tr>
<td>1968</td>
<td>Olson &amp; Edelstein</td>
<td>Skinfold, girth</td>
<td>✓</td>
</tr>
<tr>
<td>1971</td>
<td>Gwinup, Chelvam &amp; Steinberg</td>
<td>Girth</td>
<td>X</td>
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</tbody>
</table>
The history of ‘spot reduction’

<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
<th>Measurement</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>Noland &amp; Kearney</td>
<td>Skinfold, girth</td>
<td>X</td>
</tr>
<tr>
<td>1979</td>
<td>Krotkiewski et al.</td>
<td>Ultrasound, skinfold</td>
<td>X</td>
</tr>
<tr>
<td>1984</td>
<td>Katch et al.</td>
<td>Muscle biopsy</td>
<td>X</td>
</tr>
<tr>
<td>2007</td>
<td>Stallknecht, Dela &amp; Helge</td>
<td>Microdialysis</td>
<td>✓</td>
</tr>
<tr>
<td>2007</td>
<td>Kostek et al.</td>
<td>MRI, skinfold</td>
<td>X</td>
</tr>
<tr>
<td>2011</td>
<td>Vispute et al.</td>
<td>DEXA scan</td>
<td>X</td>
</tr>
<tr>
<td>2013</td>
<td>Ramírez-Campillo et al.</td>
<td>DEXA scan</td>
<td>X</td>
</tr>
</tbody>
</table>
Misconceptions in fitness professionals

- Previous research has identified errors in the knowledge of personal trainers.
- Personal trainers have high levels of confidence in their knowledge, BUT...
- Value industry experience more than qualifications, and may use unreliable information.


Critical thinking ability

• Vocational students struggle with the transition to university study

• Critical thinking ability (CTA) encompasses the independent thinking, research, and reflection skills required by higher education

• VET qualified personal trainers need to think critically
Objectives

• To determine if misconceptions are related to knowledge, or CTA, in personal trainers & VET fitness students

• To identify the sources of information used by personal trainers and VET fitness students, the trust of these sources, and their relationship to knowledge or misconceptions
Methods

• Lecturers were interviewed regarding misconceptions based on previous research, and their personal experiences. They were asked to identify, and correct, each misconception.

• Misconceptions needed to be simple enough so VET fitness students could correct them based on course content.

• Misconceptions, and corresponding factual statements, were identified.


<table>
<thead>
<tr>
<th>Misconception Statement</th>
<th>Factual Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>If a part of your body is exercised hard, you will lose body fat from that area. For</td>
<td>Fat metabolism is not a local process. You can’t pick</td>
</tr>
<tr>
<td>example, stomach crunches will help to flatten your stomach.</td>
<td>where you lose body fat from by exercising specific</td>
</tr>
<tr>
<td></td>
<td>parts of the body.</td>
</tr>
</tbody>
</table>
## Methods

<table>
<thead>
<tr>
<th>Professionals (exercise/nutrition)</th>
<th>Professionals (other health)</th>
<th>Reliable</th>
<th>Mixed/Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>degree qualified G.P. personal trainers physiotherapists</td>
<td>pharmacists</td>
<td>academic journals textbooks public health campaign</td>
<td>magazines websites social media friends chiropractor alternative health practitioner</td>
</tr>
</tbody>
</table>

Methods

Cognitive Reflection Test (CRT) – Example Item

A bat and ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost

## Participants

<table>
<thead>
<tr>
<th></th>
<th>VET students</th>
<th>PT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of participants</td>
<td>66</td>
<td>70</td>
</tr>
<tr>
<td>Gender</td>
<td>M = 58%, F = 42%</td>
<td>M = 56%, F = 44%</td>
</tr>
<tr>
<td>Age (years)</td>
<td>24.15 (8.59)</td>
<td>33.17 (9.81)*</td>
</tr>
<tr>
<td>AQF level</td>
<td>3.42 (1.84)</td>
<td>5.49 (1.82)*</td>
</tr>
<tr>
<td>Exercise AQF level</td>
<td>4.10 (0.30)</td>
<td></td>
</tr>
<tr>
<td>Length of practice (years)</td>
<td>6.10 (5.94)</td>
<td></td>
</tr>
</tbody>
</table>

* significantly different to VET students (p < 0.05)
# Data Analysis

<table>
<thead>
<tr>
<th>Measures</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge (KNOW)</td>
<td>Sum of correct answers to factual statements</td>
<td>/10</td>
</tr>
<tr>
<td>Misconceptions (MISC)</td>
<td>Sum of incorrect answers to misconception statements</td>
<td>/10</td>
</tr>
<tr>
<td>Confidence (CON)</td>
<td>Sum of confidence ratings for factual (KNOW CON) and misconception (MISC CON) statements</td>
<td>/30</td>
</tr>
<tr>
<td>Cognitive Reflection Test (CRT)</td>
<td>Sum of CRT items</td>
<td>/3</td>
</tr>
</tbody>
</table>
Data Analysis

• Differences in KNOW, MISC, CON, CRT, and trust scores between students and personal trainer were examined using an independent samples t-test.

• A hierarchical multiple linear regression analysis was used to extent to which AQF level, CRT, knowledge, and sources, predict the presence of misconceptions.

• Differences between students pre & post course were assessed using a paired samples t-test.

• A chi-squared test for independence examined differences in sources used between groups.

• Significance was accepted at a level of $p < .05$. 
Results

Cognitive Reflection Test

* significantly different to pre-VET (p < .05)
Results

Knowledge & Misconception Scores

* significantly different to other groups (p < .05)
Results

Confidence Scores

* significantly different to other groups (p < .05)
Results

Use of Sources (%)

* significantly different to other groups (p < .05)
Results

* significantly different to other groups (p < .05)
**Results**

<table>
<thead>
<tr>
<th></th>
<th>CRT</th>
<th>KNOW</th>
<th>KNOW CON</th>
<th>MISC</th>
<th>MISC CON</th>
</tr>
</thead>
<tbody>
<tr>
<td>AQF</td>
<td>.12</td>
<td>.19*</td>
<td>.24#</td>
<td>-.26#</td>
<td>.26*</td>
</tr>
<tr>
<td>CRT</td>
<td></td>
<td>.21*</td>
<td>.24#</td>
<td>-.18*</td>
<td>.20*</td>
</tr>
<tr>
<td>KNOW</td>
<td>.21*</td>
<td></td>
<td>.70#</td>
<td>-.09</td>
<td>.55#</td>
</tr>
<tr>
<td>KNOW CON</td>
<td>.24#</td>
<td>.70#</td>
<td></td>
<td>-.17</td>
<td>.85#</td>
</tr>
<tr>
<td>MISC</td>
<td>-.18*</td>
<td>-.09</td>
<td>-.17</td>
<td></td>
<td>-.13</td>
</tr>
</tbody>
</table>

* p < .05. # p < .01.
Results

• Predictors accounted for 20.4% of variance in MISC score. Significant predictors were:
  • Group status
  • CTA
  • Use of exercise professionals as a source
  • Trust of reliable sources

• Experience did not relate to KNOW or MISC
Discussion

• Knowledge scores higher than previous research

• Recent research into the sources PTs use is confirmed

• Factors other than knowledge are largely responsible for the presence of misconceptions, such as CTA and trust in reliable sources
Discussion

Is vocational training failing to prepare fitness students for employment and future study?

• The knowledge received in a course is appropriate
• The ability to make independent choices about, and accurately interpret, high quality information

Level 3

The advanced level represents an exercise professional who has a more progressed level of knowledge and skill and has considerable experience to draw upon. It is expected that a professional at this stage of development can combine the use of competencies, experience and critical thinking skills in practice.

This professional is most likely to assume a leadership and mentoring role for other exercise professionals. It is important to recognise that Level 3 is not an end point for professionals, but only a description for a higher developmental stage.
Recommendations

• Embed CTA in relevant UOCs in the fitness training package

• Model CTA as lecturers, using high quality sources, sound reasoning, and fostering an appreciation of complexity & expertise

• Develop continuing education resources to improve these skills with industry-specific content
References


Barnes, K., Desbrow, B., & Ball, L. (2016). Personal trainers are confident in their ability to provide nutrition care: a cross sectional investigation. *Public Health, 140*, 39-44


References


References


References


Taber, K. (2001). The mismatch between assumed prior knowledge and the learner’s conceptions: a typology of learning impediments. Educational Studies, 27, 553-559


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