

評估理論之應用與發展

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大綱－從基礎/理論到應用/實務

- 評估之要件
 - Concepts/definitions
 - Developing indicators/Validation/Revision
 - Validation
- 評估理論/技術之發展
 - Classic test theory, item response theory, structural equation model
 - Computerized adaptive testing
 - AI !?
- 應用
 - ADL, QOL, professional skills
 - Underlying and overarching theories

ADL assessments – underlying traits/theories, validation, and new measures

- ADL concepts and definitions
 - Scope: Basic ADL, Instrumental ADL
 - **Aspect/perspective: actual performance, capability, ability, perceived difficulty**
- Validation (measurement theory)
 - Reliability: random measurement error (stability of score)
 - Validity: systematic measurement error (concept matching)
 - Responsiveness: change detection
- Development of new measures

Scope/Depth

The 3 ADL aspects

| Aspect | Description | ICF |
|-------------------------|---|-------------------|
| Ability/ Capability | A person can do in a standardized context | Activity |
| Actual performance | Actually does do in his/her own environment | Participati on |
| Perceived difficulty | Subjective perception of difficulty doing ADL | importance/needs |

* Holsbeeke et al. Capacity, capability, and performance: different constructs or three of a kind? *Arch Phys Med Rehabil.* 2009;90:849-855.

The aspect of performance

- The same as the original 10-item BI

Mode of administration

- Face to face interview
- Proxy-administered

Instructions

- Ex: 穿衣服
- 請問這一兩天穿衣服，是不是都自己穿，沒有他人幫忙？

Response categories

- 2 自主獨立
- 1 部分獨立
- 0 完全依賴

The aspect of self-perceived difficulty

Mode of
administration

- Face to face interview

Instructions

- Ex: 穿衣服
- 這一兩天穿衣服的整個過程，自己從事起來，是覺得簡單、有點難、還是很難？

Response
categories

- 2- 簡單
- 1- 有點難
- 0- 很難

The aspect of ability

Mode of administration

- A simulated standardized context and procedures

Instructions

- Ex: 穿衣服
- 請你將這件衣服/外套/褲子穿上，並將釦子扣好/拉鍊拉起。
- 請你將衣服/褲子脫掉。

Response categories

- 2 完全可以自己做
- 1 部份可以自己做
- 0 無法自己做

The 3-aspect BI - 2014

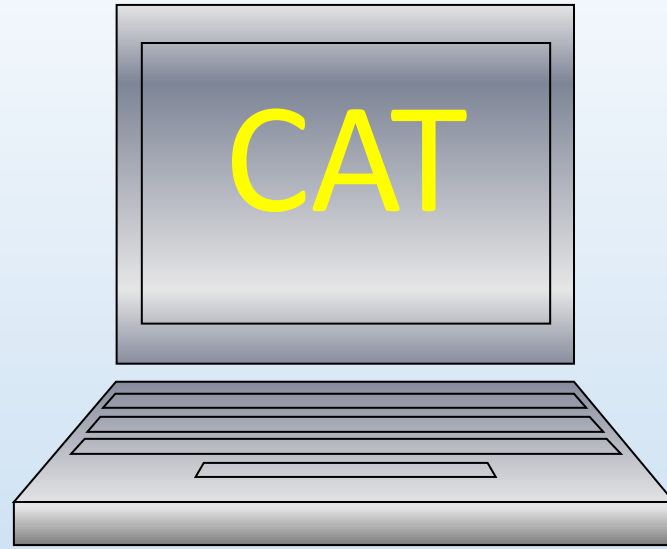
| 項目 | 平常表現 | 困難程度 | 執行能力 |
|------------|----------------------------|-----------------------|------------------------------------|
| 1. 餵食 | 2 自主獨立 1 部分獨立 0 完全依賴 | 2 簡單 1 有點難 0 很難 | 2 完全可以自己做 1 部分可以自己 做 0 無法自己做 |
| 2. 個人清洗衛生 | 1 0 | 2 1 0 | 2 1 0 |
| 3. 洗澡 | 1 0 | 2 1 0 | 2 1 0 |
| 4. 穿衣 | 2 1 0 | 2 1 0 | 2 1 0 |
| 5. 大便控制 | 2 1 0 | 2 1 0 | |
| 6. 小便控 | 2 1 0 | 2 1 0 | |
| 7. 如廁 | 2 1 0 | 2 1 0 | 2 1 0 |
| 8. 移位 | 3 2 1 0 | 2 1 0 | 2 1 0 |
| 9. 行走 (室內) | 3 2 1 0 | 2 1 0 | 2 1 0 |
| 10. 爬樓梯 | 2 1 0 | 2 1 0 | 2 1 0 |

My ADL-assessment papers (since 1997)

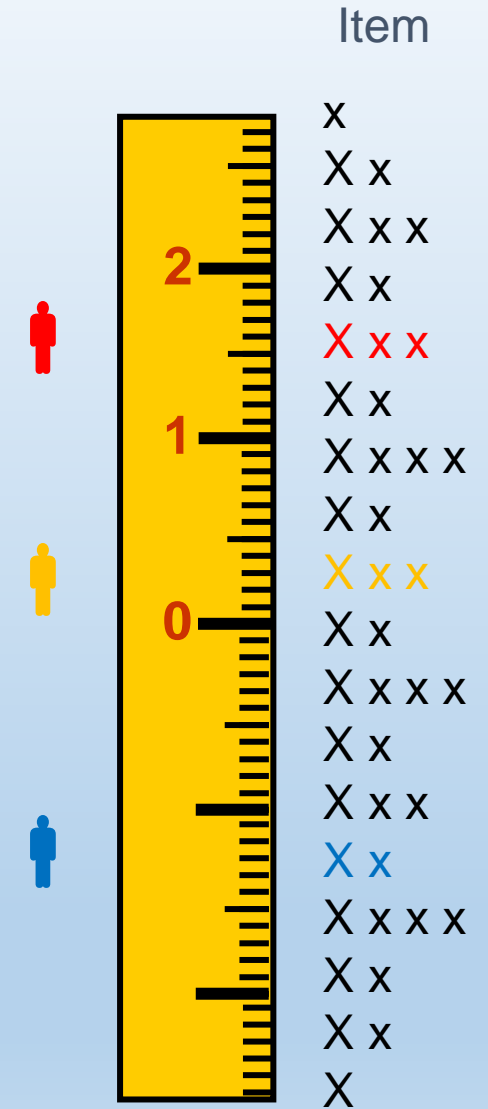
1. Minimal detectable change on the Lawton instrumental activities of daily living scale in community-dwelling patients with schizophrenia. *Am J Occup Ther.* 2018;72:7205195020p7205195021-7205195020p7205195027.
2. Item-saving assessment of self-care performance in children with developmental disabilities: A prospective caregiver-report computerized adaptive test. *PLoS One.* 2018;13:e0193936.
3. Test-retest reliability and responsiveness of the Barthel index-based supplementary scales in patients with stroke. *Eur J Phys Rehabil Med.* 2017;53:710-718.
4. Construct validity of the Chinese version of the activities of daily living rating scale III in patients with schizophrenia. *PLoS One.* 2015;10:e0130702.
5. Development and validation of the standard Chinese version of the CARE item set (CARE-C) for stroke patients. *Medicine (Baltimore).* 2015;94:e1828.
6. 精神分裂症研究常用之工具性日常生活活動評估工具之心理計量特性回顧. *職能治療學會雜誌.* 2014;32:35-64.
7. Reliability and responsiveness of the activities of daily living computerized adaptive testing system in patients with stroke. *Arch Phys Med Rehabil.* 2014;95:2055-2063.
8. Development of two Barthel index-based supplementary scales for patients with stroke. *PLoS One.* 2014;9:e110494.
9. Validation of a Chinese version of the Frenchay Activities Index in patients with traumatic limb injury. *J Occup Rehabil.* 2014;24:439-445.
10. Development of a computerized adaptive test for assessing activities of daily living in outpatients with stroke. *Phys Ther.* 2013;93:681-693.
11. Smallest real difference of 2 instrumental activities of daily living measures in patients with chronic stroke. *Arch Phys Med Rehabil.* 2012;93:1097-1100.
12. Test-retest reliability and validity of the comprehensive activities of daily living measure in patients with stroke. *J Rehabil Med.* 2012;44:637-641.
13. The diverse constructs use of activities of daily living measures in stroke randomized controlled trials in the years 2005-2009. *J Rehabil Med.* 2012;44:720-726.
14. The competence of fieldwork students in administering the Barthel Index. *Hong Kong J Occup Ther.* 2008;18:28-33.
15. Establishing the minimal clinically important difference of the Barthel Index in stroke patients. *Neurorehabil Neural Repair.* 2007;21:233-238.
16. A Rasch analysis of the Frenchay Activities Index in patients with spinal cord injury. *Spine.* 2007;32:437-442.
17. 日常生活活動功能評量之四十年回顧. *台灣復健醫學雜誌.* 2006;34:63-71.
18. 長期照護機構住民之工具性日常生活活動需求評估. *臺灣老年醫學雜誌.* 2006;2:116-129.
19. 精神病人日常生活功能評量表第三版之信度與效度初探. *台灣職能治療學會雜誌.* 2004;22:1-14.
20. Rasch analysis of combining two indices to assess comprehensive ADL function in stroke patients. *Stroke.* 2004;35:721-726.
21. Comparison of the psychometric characteristics of the functional independence measure, 5 item Barthel index, and 10 item Barthel index in patients with stroke. *J Neurol Neurosurg Psychiatry.* 2002;73:188-190.
22. Psychometric characteristics of the Barthel activities of daily living index in stroke patients. *J Formos Med Assoc.* 2001;100:526-532.
23. Evaluation of stroke patients with the extended activities of daily living scale in Taiwan. *Disabil Rehabil.* 2000;22:495-500.
24. 芙蘭切活動量表之信度及效度驗證. *慈濟醫學雜誌.* 1997;9:123-130.
25. 中風患者芙蘭切活動量表效度之再驗證：大台北地區研究. *台灣醫學* 1997;1:696-702.

My ADL assessments: key papers

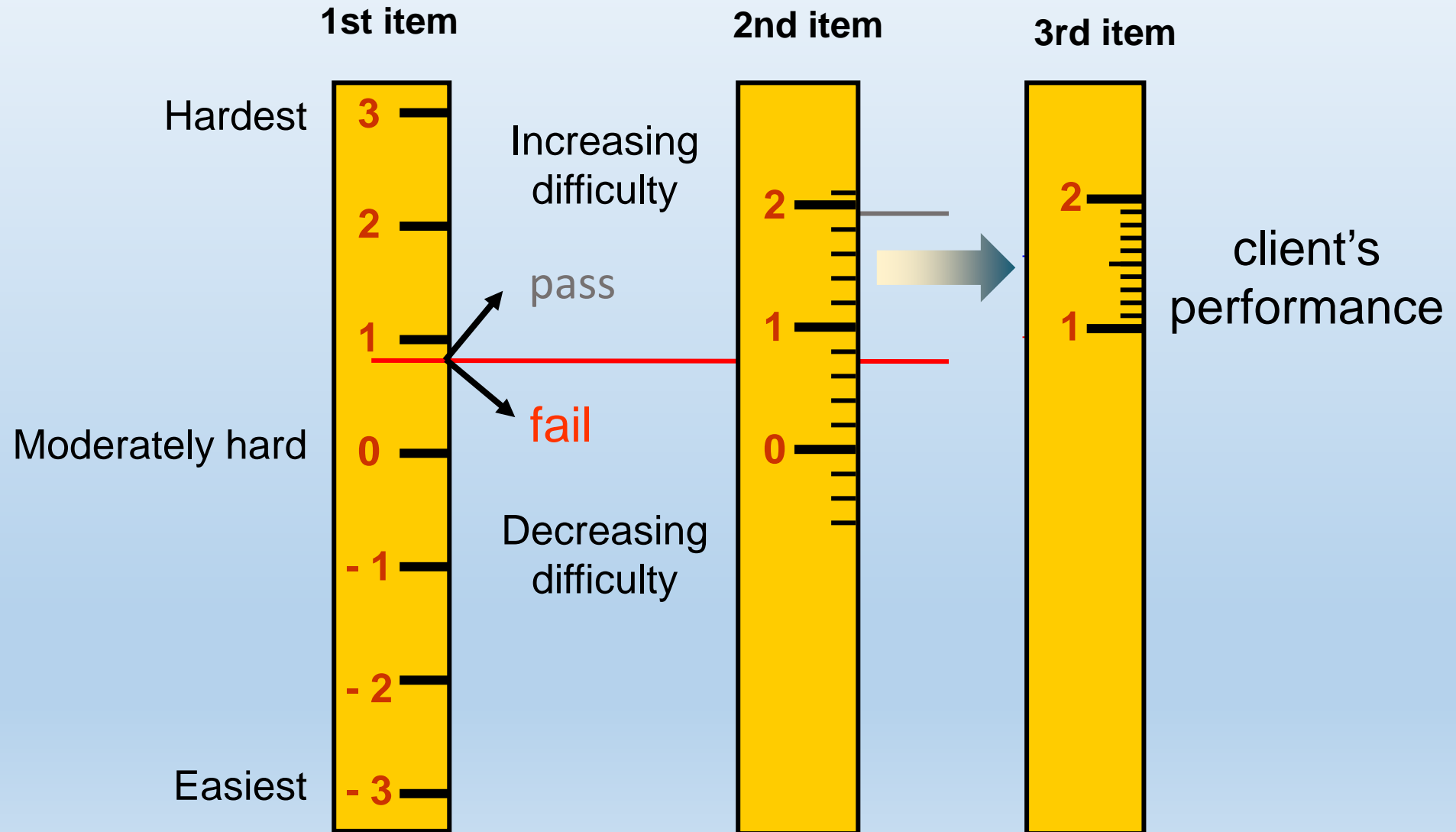
1. Lee YC, Chen SS, Koh CL, et al. Development of **two Barthel Index-based Supplementary Scales** for patients with stroke. PLoS One. 2014;9:e110494. [26] 【新工具】
2. Hsueh IP, Chen JH, Wang CH, et al. Development of a **computerized adaptive test for assessing activities of daily living** in outpatients with stroke. Phys Ther. 2013;93:681-693. [24] 【新工具】
3. Hsieh CL, Hoffmann T, Gustafsson L, et al. **The diverse constructs use of activities of daily living measures** in stroke randomized controlled trials in the years 2005-2009. J Rehabil Med. 2012;44:720-726. 【評論/實證】
4. Hsieh YW, Wang CH, Wu SC, et al. Establishing the **minimal clinically important difference of the Barthel Index** in stroke patients. Neurorehabil Neural Repair. 2007;21:233-238. [216] 【驗證】
5. 張席熒, 謝妤蕙, 薛漪平, et al. 日常生活活動功能評量之四十年回顧. 台灣復健醫學雜誌. 2006;34:63-71.
6. 褚增輝, 謝清麟. 精神病人日常生活功能評量表第三版之信度與效度初探. 台灣職能治療學會雜誌. 2004;22:1-14. 【改良】
7. Hsueh IP, Lin JH, Jeng JS, et al. Comparison of the psychometric characteristics of the functional independence measure, 5 item Barthel index, and 10 item Barthel index in patients with stroke. J Neurol Neurosurg Psychiatry. 2002;73:188-190. [411] 【驗證/比較】
8. Hsueh IP, Lee MM, Hsieh CL. Psychometric characteristics of the Barthel activities of daily living index in stroke patients. J Formos Med Assoc. 2001;100:526-532. [281] 【驗證/比較】



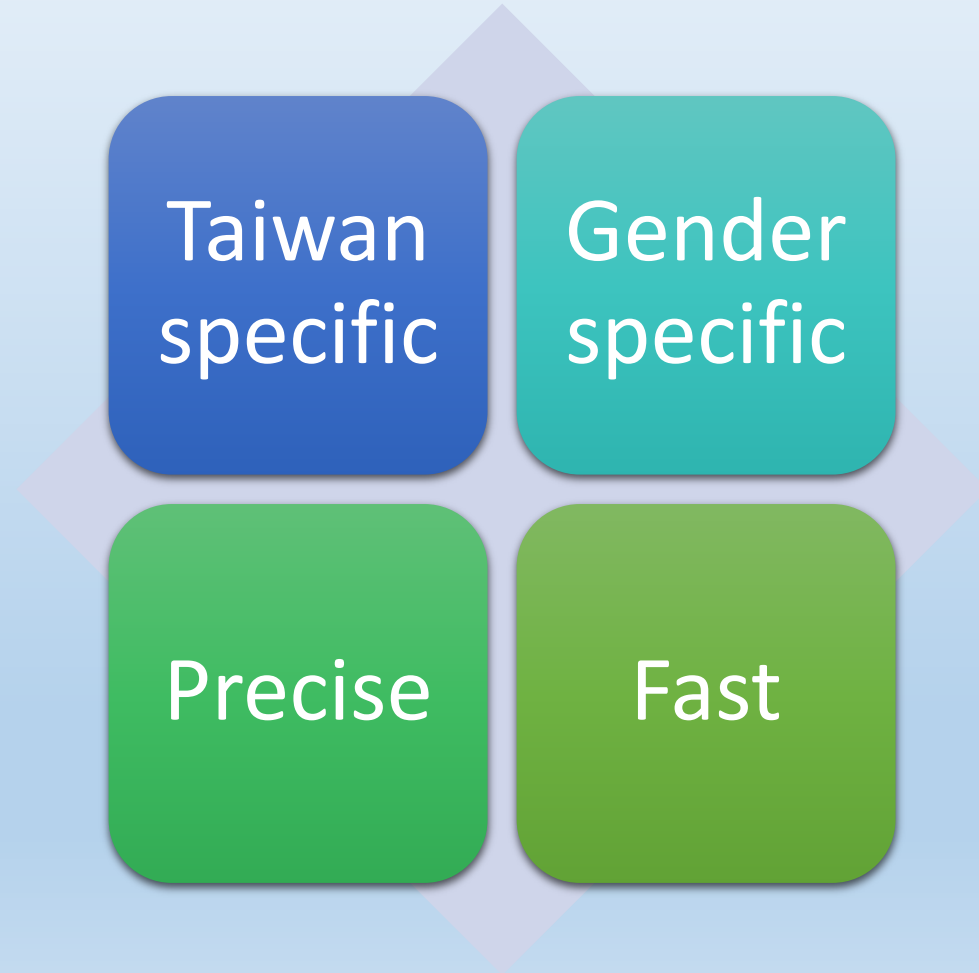
- Computer-based testing
- Adaptive testing
 - Mainly tested on items with difficulty nearby clients' ability
 - Based on previous responses
- computerized adaptive test (CAT)



Fast and Precise



The ADL CAT -- via Interview - 2013



Basic ADL 12項目與評分

- 最近一、兩天，從事 ADL 活動的情形
- 評分標準
 - 0: 完全協助
 - 1: 部份獨立
 - 2: 完全獨立，但並非每次
 - 3: 完全獨立，且每次

| 12 項: | |
|-----------|---------|
| 喝水 | 進食 |
| 洗臉 | 刷牙 |
| 如廁—小便 | 如廁—大便 |
| 穿/脫 上半身衣物 | 穿 下半身衣物 |
| 起床 | |
| 室內行走 | 爬樓梯 |

22項 IADL

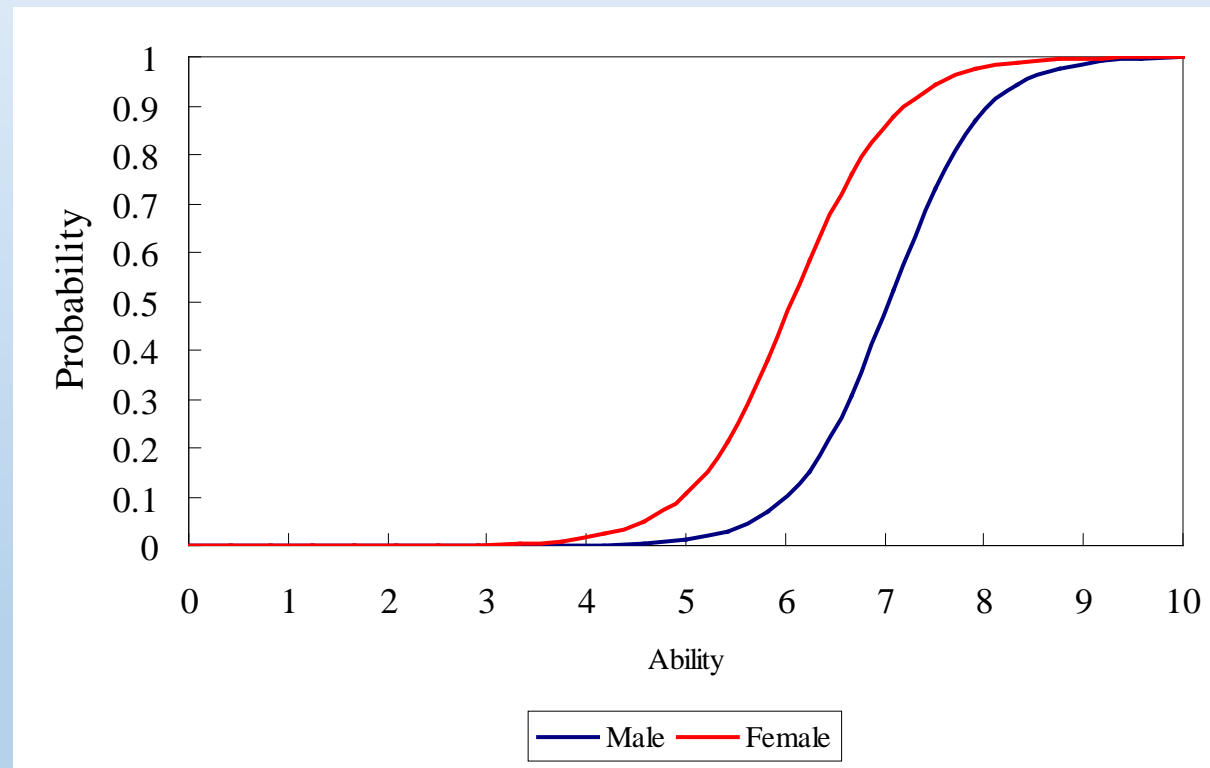
- 最近一週從事活動的情形
- 評分標準同Basic ADL

| 健康照護 | 戶外活動 | 家務處理 | 休閒 | 工作 |
|------|---------|--------|-------|-----|
| 服藥 | 室外行走 | 準備簡單餐點 | 讀書 | 無給薪 |
| | 搭乘交通工具 | 準備食材 | 讀報 | 有給薪 |
| | | 洗碗 | 看電視 | |
| 金錢處理 | 社交活動 | 垃圾處理 | 使用電腦 | |
| 提款 | 使用電話 | 倒垃圾 | 藝術活動 | |
| | 外出與親友見面 | 洗衣服 | 下棋、玩牌 | |
| | | | 卡拉OK | |
| | | | SPA | |

性別/難度 差異項目

| Item | Slope | Difficulty |
|--------|---------|------------|
| 準備簡單餐點 | 1.3/2.6 | 0.7/0.3 |
| 洗碗 | 2.0/3.7 | 1.2/0.7 |
| 洗衣服 | 2.1/1.9 | 1.2/0.7 |
| 準備食材 | 2.7/1.9 | 1.4/0.8 |
| 垃圾處理 | 1.3/2.2 | 1.4/0.8 |
| 倒垃圾 | 1.5/4.3 | 1.5/1.0 |

性別差異項目：洗衣服



Stopping rules for the ADL CAT

Reliability > 0.90

= 7 items

ADL

初始狀態判斷，按下按"送出"鈕後，將進入正式測試

請問受測者的性別為？

- 男生
- 女生

送出

[回主選單](#)

<http://13.114.225.208/cat/>

穿下半身衣物

Now Select Num is 34

ADL 第1題

穿下半身衣物

穿上褲子、鞋、襪等衣物，包括扣釦子、拉拉鍊或綁鞋帶。

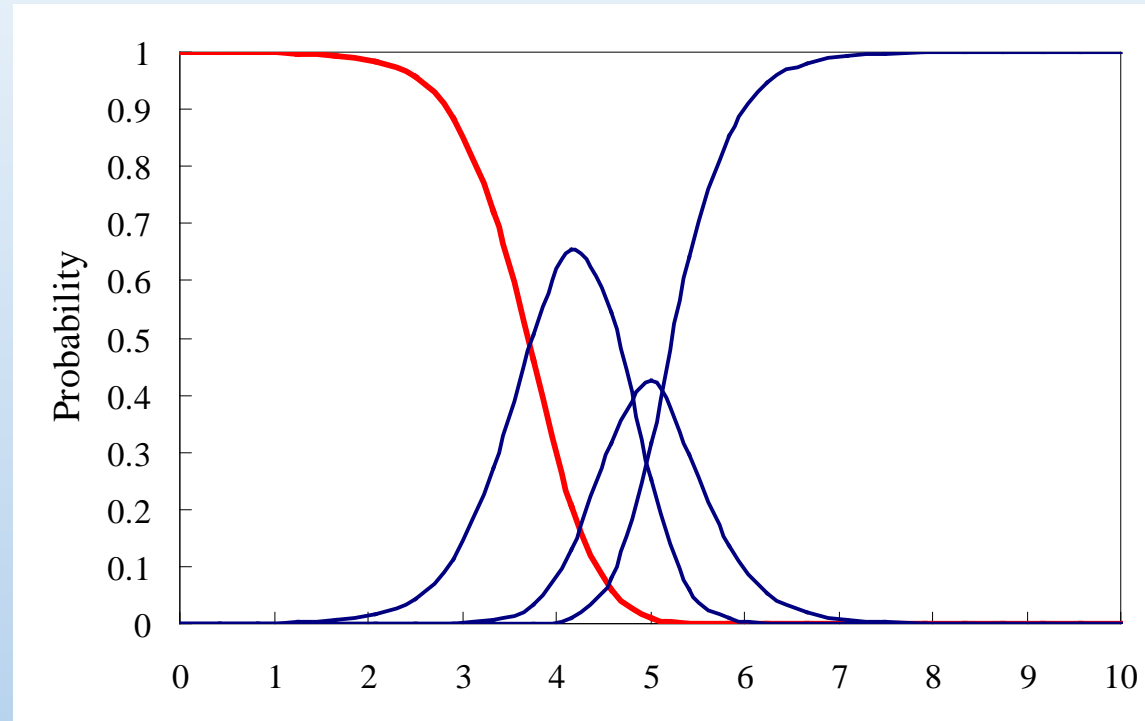
(1) 完全協助

(2) 部份獨立

(3) 完全獨立,但並非每次

(4) 完全獨立,且每次

[回主選單](#)



如廁(小便)

Now Select Num is 26

ADL 第2題

如廁(小便)

在廁所中自行解便，整理衣物、清理自己及排泄物。

(1) 完全協助

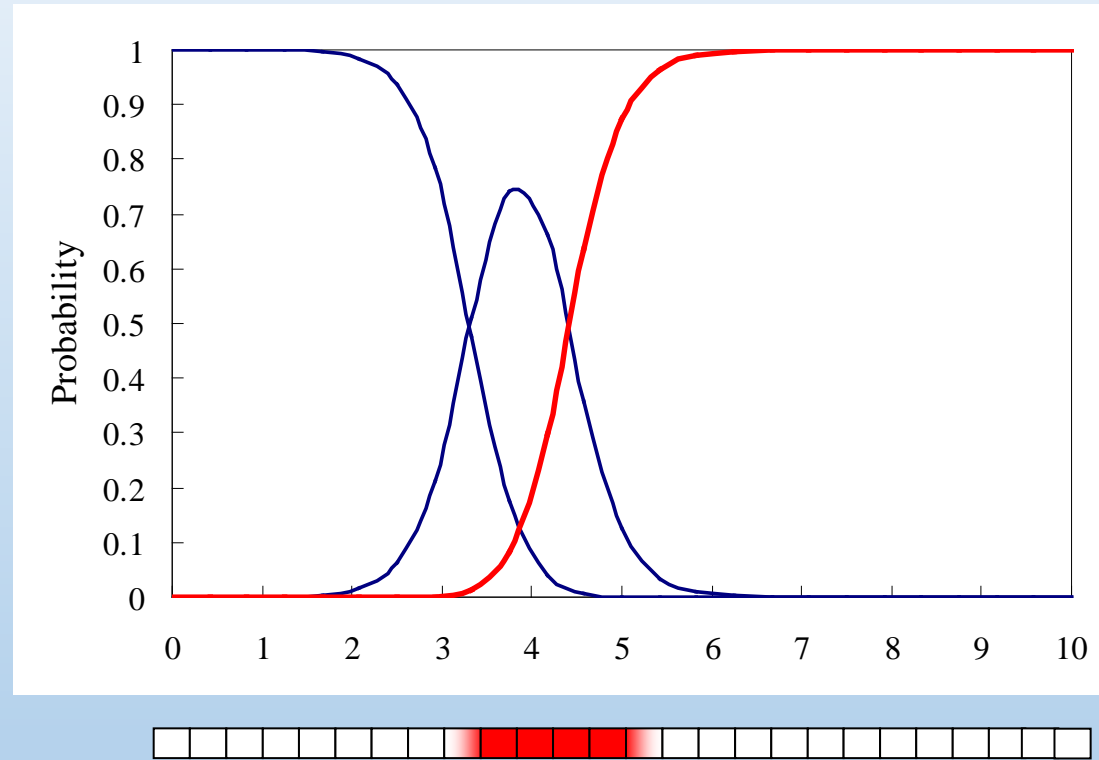
(2) 部份獨立

(3) 完全獨立,但並非每次

(4) 完全獨立,且每次

送出

[回主選單](#)



脫上半身衣物

Now Select Num is 33

ADL 第3題

脫上半身衣物

脫下開襟式襯衫、拉鍊式外套或套頭衣服等上衣，包括解釦子或解拉鍊。

(1) 完全協助

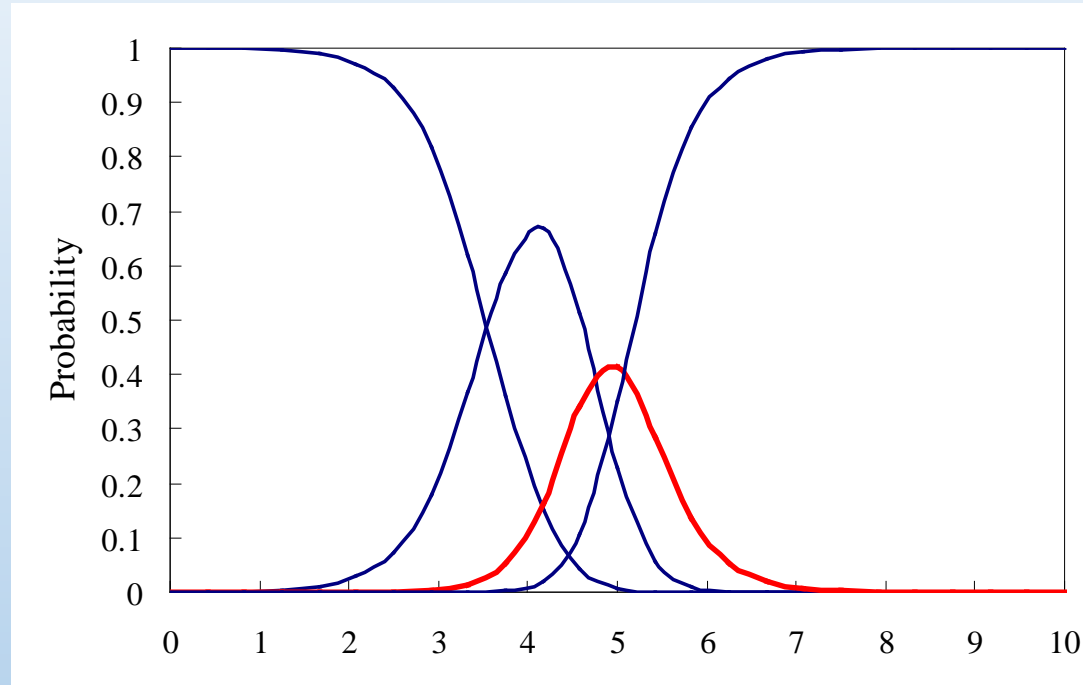
(2) 部份獨立

(3) 完全獨立,但並非每次

(4) 完全獨立,且每次

送出

[回主選單](#)



Final score:
 4.5 ± 0.4
Reliability 0.96

ADL 評估/驗證

- 探索/驗證 常用工具/概念 之缺失
 - 發現/確認問題
 - + some validations of postural control measures

升等教授主論文 2003

| 標題 | 引用次數 | 年份 |
|---|------|------|
| <p>Analysis and comparison of the psychometric properties of three balance measures for stroke patients HF Mao, IP Hsueh, PF Tang, CF Sheu, CL Hsieh Stroke 33 (4), 1022-1027</p> | 544 | 2002 |
| <p>Trunk control as an early predictor of comprehensive activities of daily living function in stroke patients CL Hsieh, CF Sheu, IP Hsueh, CH Wang Stroke 33 (11), 2626-2630</p> | 425 | 2002 |
| <p>Comparison of the psychometric characteristics of the functional independence measure, 5 item Barthel index, and 10 item Barthel index in patients with stroke IP Hsueh, JH Lin, JS Jeng, CL Hsieh Journal of Neurology, Neurosurgery & Psychiatry 73 (2), 188-190</p> | 411 | 2002 |
| <p>Psychometric characteristics of the Barthel activities of daily living index in stroke patients IP Hsueh, MM Lee, CL Hsieh Journal of the Formosan Medical Association 100 (8), 526-532</p> | 281 | 2001 |

ADL 評估/創新—從理論到技術

- 發展/驗證 新工具/概念
 - 創新/確認
- 個案需求與成效驗證
- 臨床與研究之基礎

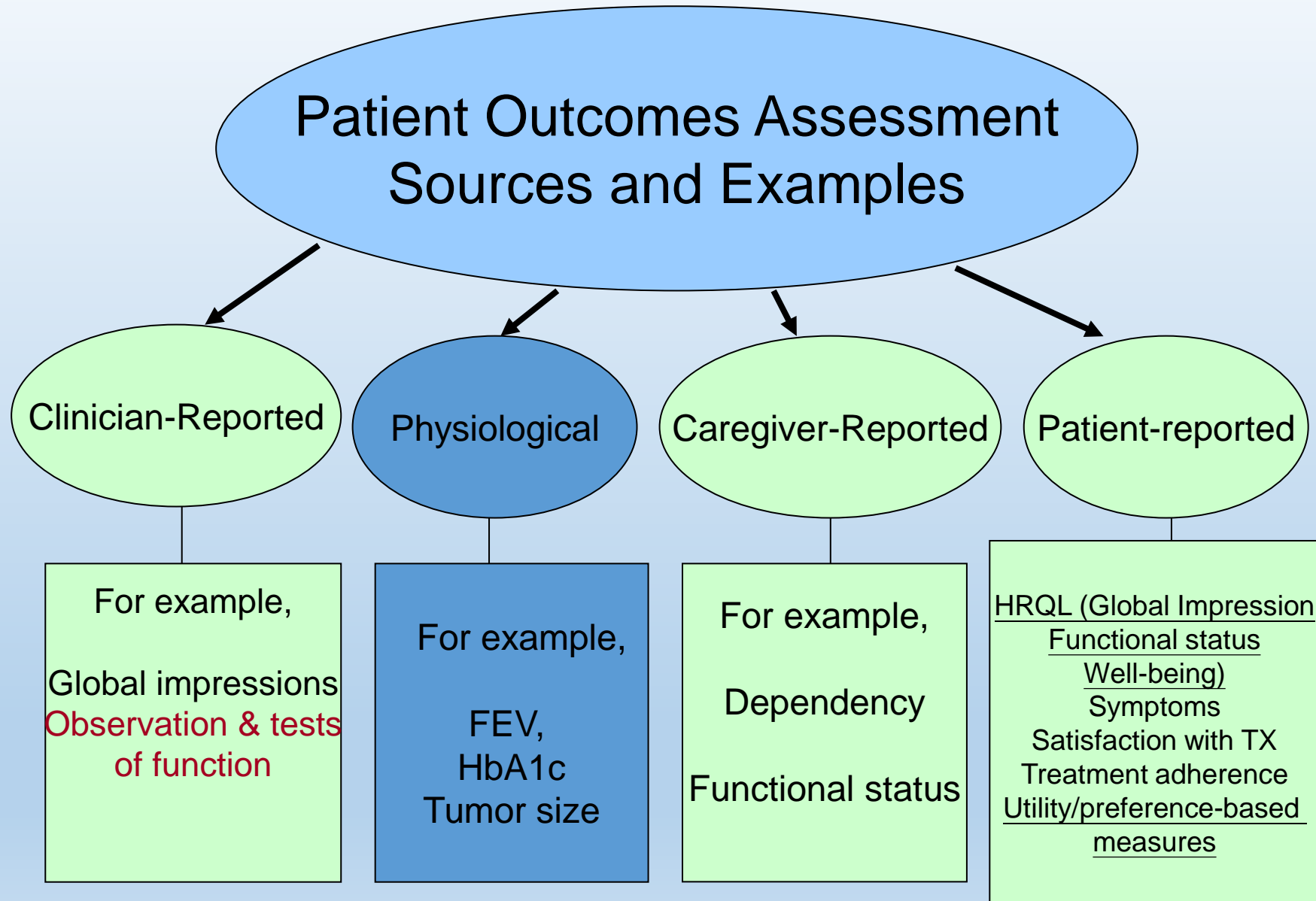
ADL 應用 – overarching theories

ADL



QOL

狹義 vs 廣義的成效指標—理論與實證—從學術到臨床



QOL 評估 – underlying theories

- QOL concepts and definitions
 - Structure: formative or reflective
 - Dimension/perspective: multi-dimension
- Validation
 - Reliability: random measurement error (stability of score)
 - Validity: systematic measurement error (concept matching)
 - Responsiveness: change detection

QOL vs Health-related QOL (HRQOL)

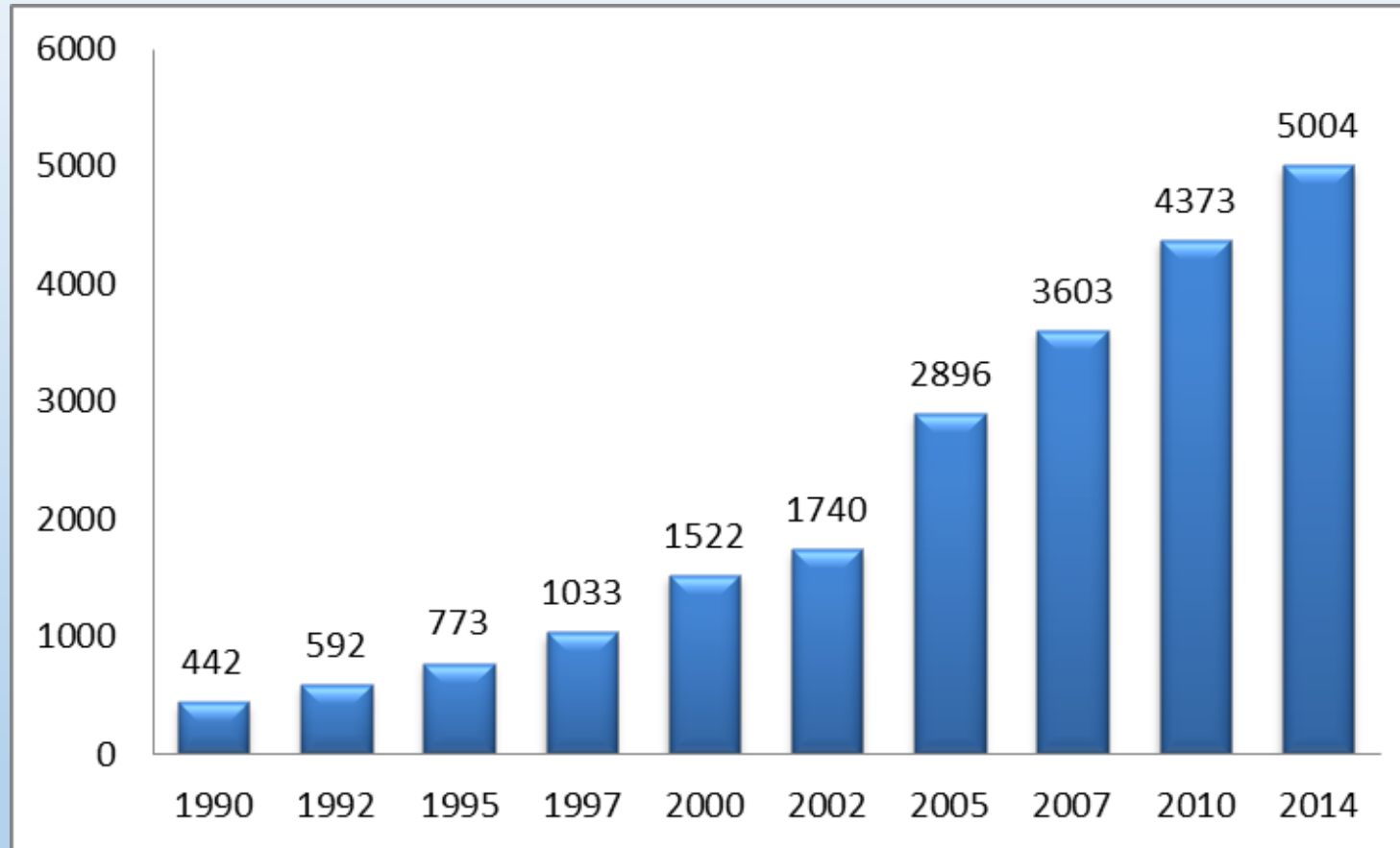
- 皆為多向度
- **QOL**涵蓋廣泛，包含經濟、政治、宗教、文化、哲學、生理、精神與人際關係等
- **HRQOL**強調健康相關的生活品質，與醫療衛生較相關。
 - 主觀生活功能行使以及生活各方面滿意度(安適感)
 - 普遍基於**WHO**對於健康之定義
 - 生理、心理、社會健康

HRQOL vs Global health

- 皆評量病人之「整體」健康狀態
- 差異：

| | 評量重點 | 病人感受 | 測量方式 |
|---------------|---------|------|--------|
| HRQOL | 病人的主觀感受 | 重視心理 | 病人自填 |
| Global health | 客觀數據 | 重視生理 | 專業人員施測 |

近年QOL論文數量龐大



資料來源：PubMed 資料庫

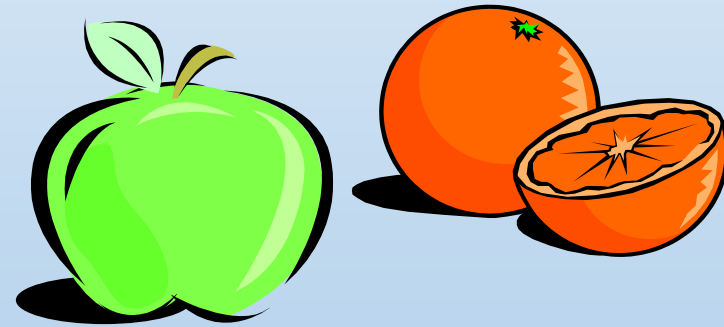
Quality of Medicine and decision making

- Safety first



Health Economics

- Comparing different allocations
 - Should we spent our money on
 - Wheel chairs
 - Screening for cancer
 - Comparing costs
 - Comparing outcome
- Outcomes must be comparable
 - Make a generic outcome measure



如何比較蘋果與橘子，theory?

Outcomes for Economic Evaluation

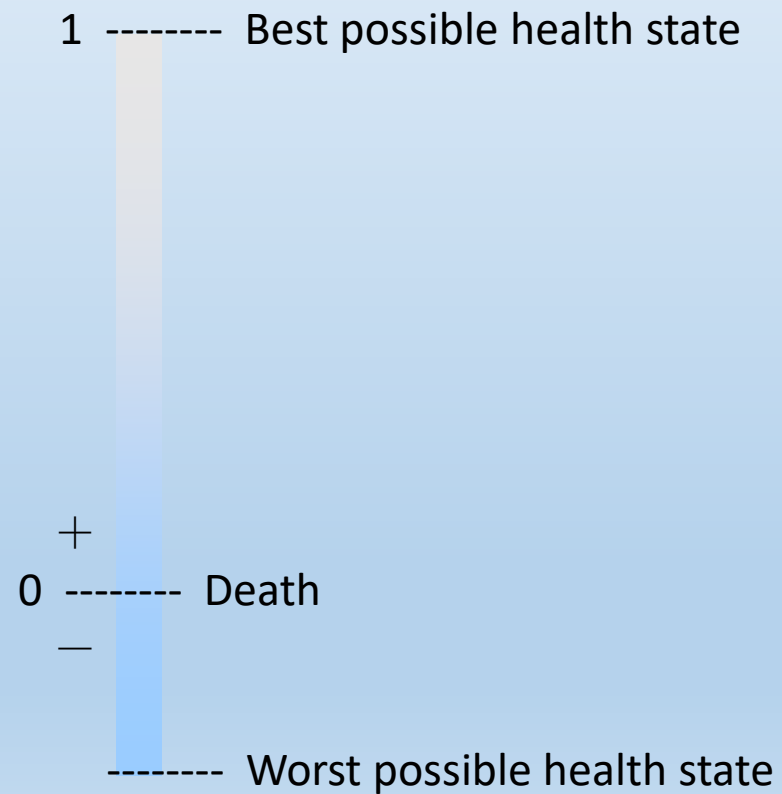
| <u>Analysis</u> | <u>Outcome Valuation</u> |
|--------------------|---|
| Cost-minimization | Multiple outcomes in natural units – examine cost |
| Cost-effectiveness | Intermediate – blood pressure Final – life years gained |
| Cost-utility | Multiple outcomes combined into weighted index (e.g., QALY) |
| Cost-benefit | Monetary (WTP) |

Cost-Effectiveness (Utility) analysis

- Effectiveness: the health benefit or outcome achieved with the intervention
 - Biological or health indicators
- Utility: value of health
 - An individual's **preference/value** for a particular health state or outcome
 - preferences (valuations) = utilities
 - **A single summary measure of HRQOL**
 - Standard gamble
 - Time-trade off
 - Visual analogue scale

Utilities

- Continuum between 0 & 1



EQ-5D

5 domains

3 levels

$3^5 = 243$

health states

Decision theory-- a multi-attribute utility

行動

我可以四處走動，沒有任何問題。

1

我行動有些不便。

2

我臥病在床。

3

自我照顧

我能照顧自己，沒有任何問題。

我在盥洗、洗澡或穿衣方面有些問題。

我無法自己盥洗、洗澡或穿衣。

平常活動（如工作、讀書、家事、家庭或休閒活動）

我能從事平常活動，沒有任何問題。

我在從事平常活動方面有些問題。

我無法從事平常活動。

疼痛/不舒服

我沒有任何疼痛或不舒服。

我覺得中度疼痛或不舒服。

我覺得極度疼痛或不舒服。

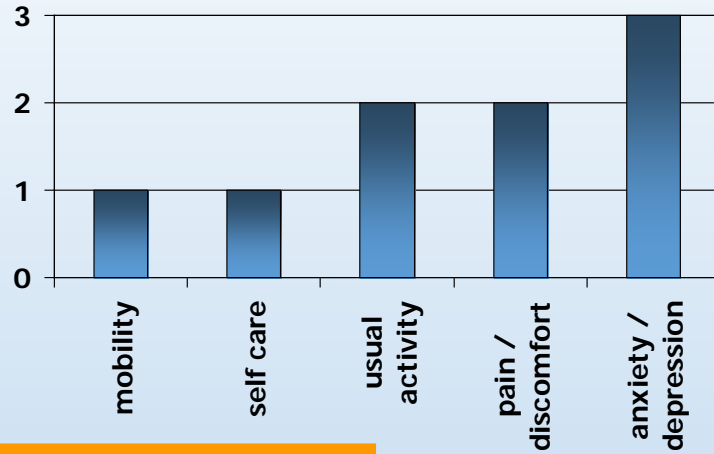
焦慮/沮喪

我不覺得焦慮或沮喪。

我覺得中度焦慮或沮喪。

我覺得極度焦慮或沮喪。

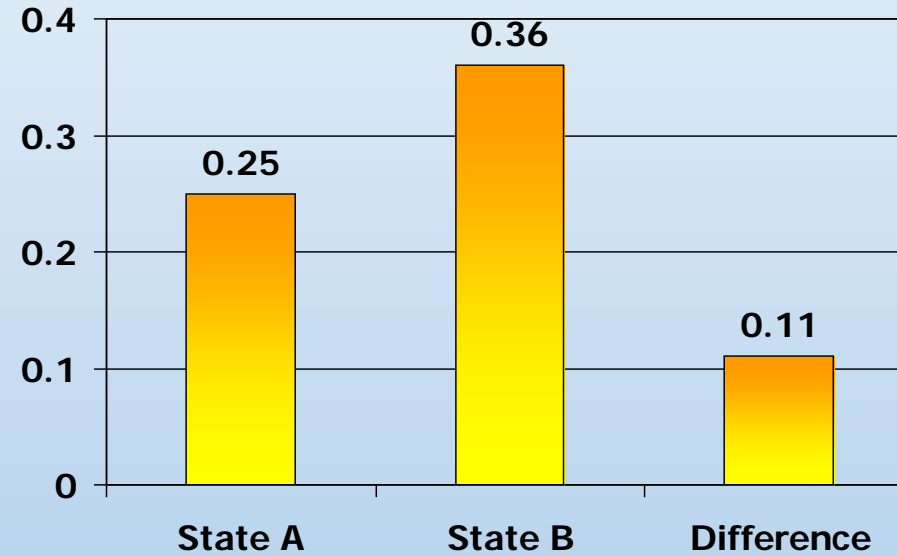
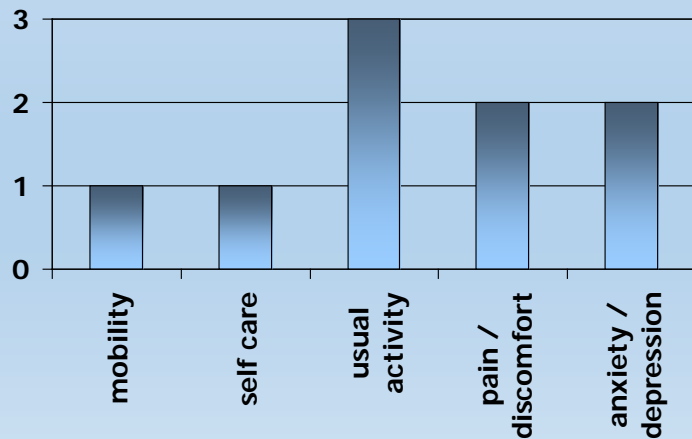
Profile A : 1 1 2 2 3



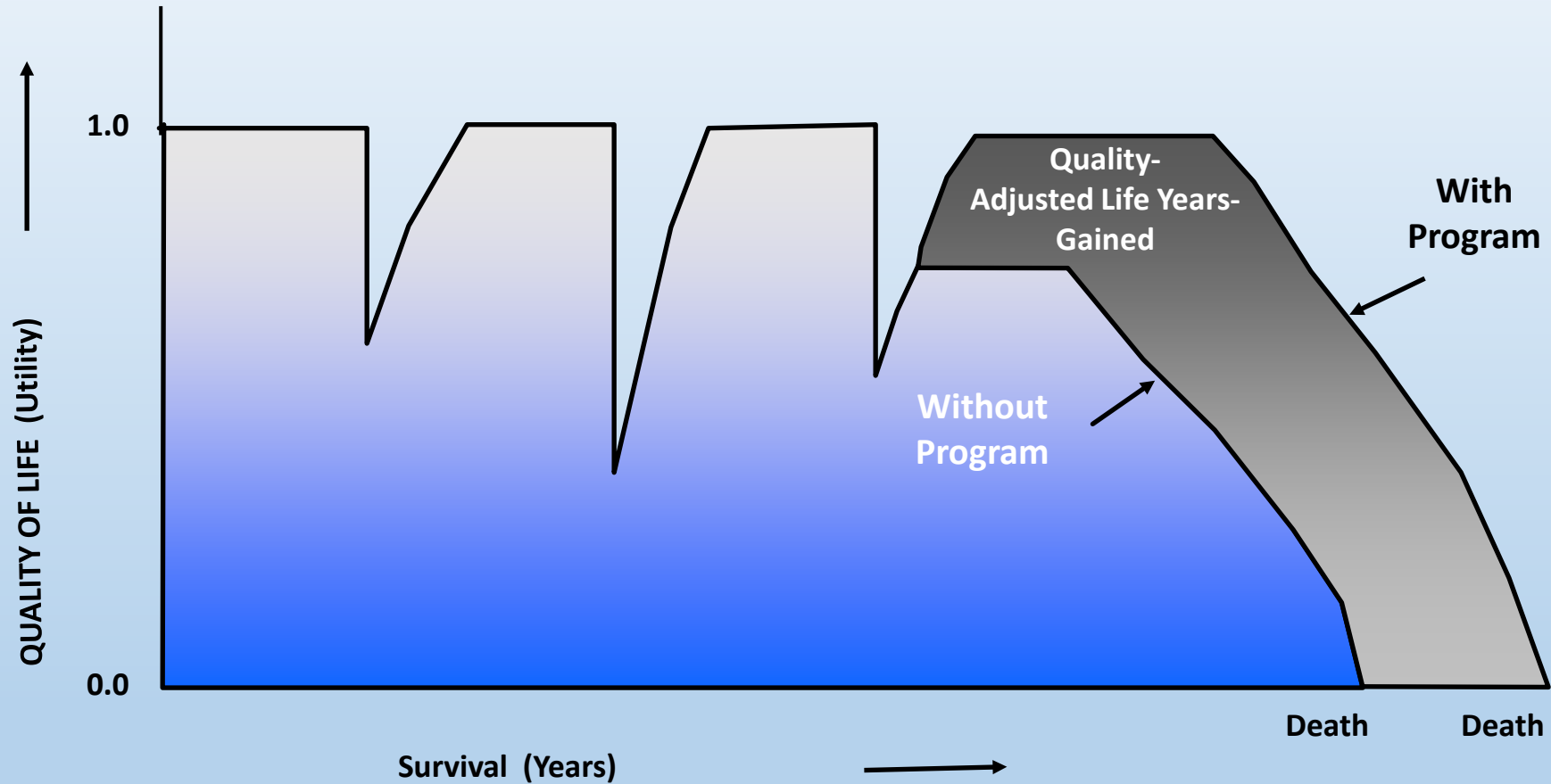
Population preference weights



Profile B : 1 1 3 2 2



Cost-Utility Analysis



Or: Cost per QALYs saved or gained by undertaking one program vs. another

My QOL-assessment papers (since 2005)

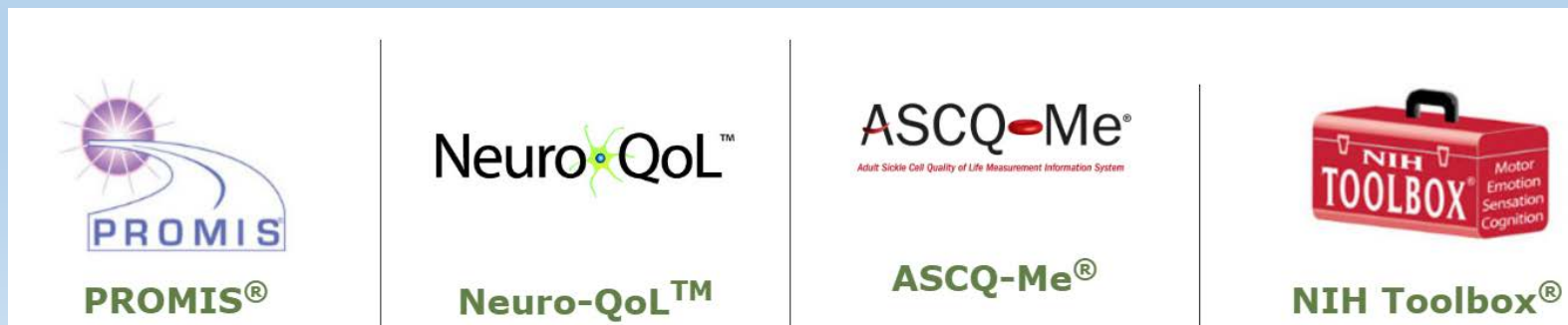
1. Development of a Social Functioning Assessment Using Computerized Adaptive Testing for Patients With Stroke. Arch Phys Med Rehabil. 2018;99:306-313.
2. 台灣版WHOQOL-OLD問卷之發展與驗證. 台灣公共衛生雜誌. 2017;36:239-258.
3. Comparison of construct validity of two short forms of Stroke-Specific Quality of Life scale. PLoS One. 2017;12:e0188478.
4. 精神病患者生活品質問卷應用於思覺失調症患者之最小可偵測變化值. 職能治療學會雜誌. 2015;33:132-148.
5. Validation of the EQ-5D in Patients with Traumatic Limb Injury. J Occup Rehabil. 2015;25:387-393.
6. Examining unidimensionality and improving reliability for the eight subscales of the SF-36 in opioid-dependent patients using Rasch analysis. Qual Life Res. 2015;24:279-285.
7. Tests of data quality, scaling assumptions, reliability, and construct validity of the SF-36 health survey in people who abuse heroin. J Formos Med Assoc. 2014;113:234-241.
8. Validating and improving the reliability of the EORTC QLQ-C30 using a multidimensional rasch model. Value Health. 2013;16:848-854.
9. Estimating quality weights for EQ-5D (EuroQol-5 dimensions) health states with the time trade-off method in Taiwan. J Formos Med Assoc. 2013;112:699-706.
10. Construct validity of the stroke-specific quality of life questionnaire in ischemic stroke patients. Arch Phys Med Rehabil. 2011;92:1113-1118.
11. Validation of EQ-5D in patients with cervical cancer in Taiwan. Support Care Cancer. 2010;18:1279-1286.
12. Measurement of quality of life using EQ-5D in patients on prolonged mechanical ventilation: comparison of patients, family caregivers, and nurses. Qual Life Res. 2010;19:721-727.
13. Agreement between the WHOQOL-BREF Chinese and Taiwanese versions in the elderly. J Formos Med Assoc. 2009;108:164-169.
14. Development and validation of a WHOQOL-BREF Taiwanese audio player-assisted interview version for the elderly who use a spoken dialect. Qual Life Res. 2007;16:1375-1381.
15. 閩南語版世界衛生組織生活品質問卷中量尺語詞之選擇. 台灣醫學. 2005;9:584-594.
16. A validity study of the WHOQOL-BREF assessment in persons with traumatic spinal cord injury. Arch Phys Med Rehabil. 2004;85:1890-1895.

My QOL-assessment key papers

1. Lee SC, Huang YJ, Lin GH, et al. Development of a Social Functioning Assessment Using Computerized Adaptive Testing for Patients With Stroke. Arch Phys Med Rehabil. 2018;99:306-313.
2. Chou CY, Huang CY, Huang YJ, et al. Comparison of construct validity of two short forms of Stroke-Specific Quality of Life scale. PLoS One. 2017;12:e0188478.
3. 李淑君, 尤菀薈, 邱恩琦, et al. 精神病患者生活品質問卷應用於思覺失調症患者之最小可偵測變化值. 職能治療學會雜誌. 2015;33:132-148.
4. Shih CL, Chen CH, Sheu CF, et al. Validating and improving the reliability of the EORTC QLQ-C30 using a multidimensional Rasch model. Value Health. 2013;16:848-854.
5. Lee HY, Hung MC, Hu FC, et al. Estimating quality weights for EQ-5D (EuroQol-5 dimensions) health states with the time trade-off method in Taiwan. J Formos Med Assoc. 2013;112:699-706. [48]
6. Chien CW, Wang JD, Yao G, et al. Development and validation of a WHOQOL-BREF Taiwanese audio player-assisted interview version for the elderly who use a spoken dialect. Qual Life Res. 2007;16:1375-1381. [23]

Recommended Health Measures: NIH supported/suggested

- NIH Toolbox[®] batteries for Cognition, Emotion, Motor, and Sensation
- PROMIS[®] Global (10 items measuring physical health and mental health)
- PROMIS-29 Profile (measures Physical Function, Fatigue, Pain Interference, Pain Intensity, Sleep Disturbance, Depression, Anxiety, and Ability to Participate in Social Roles and Activities)
- Neuro-QoL[™] short forms for people with neurological conditions





PROMIS



Including patient- and parent-report measures
Short forms and CAT
Free
Since 2004



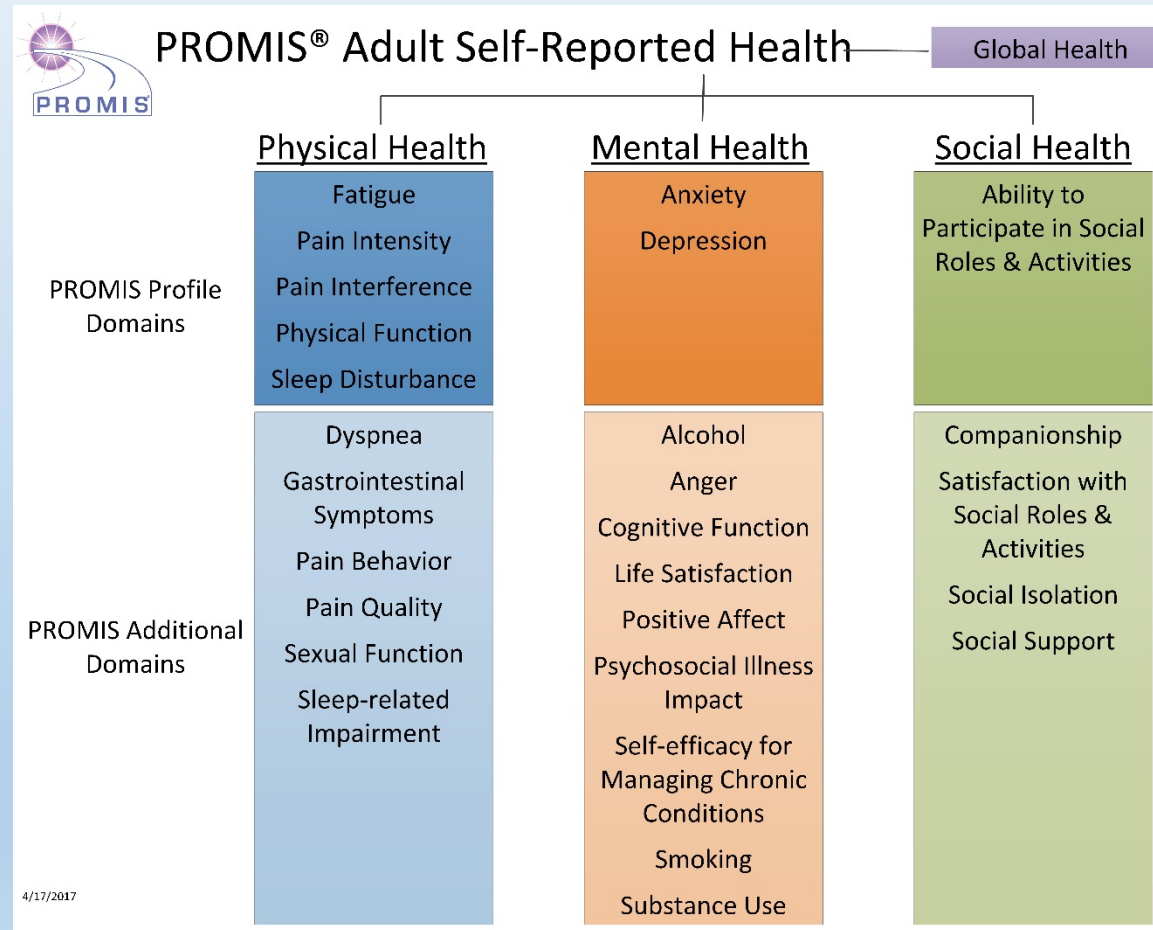
<http://www.healthmeasures.net/explore-measurement-systems/promis>

PROMIS: since 2004

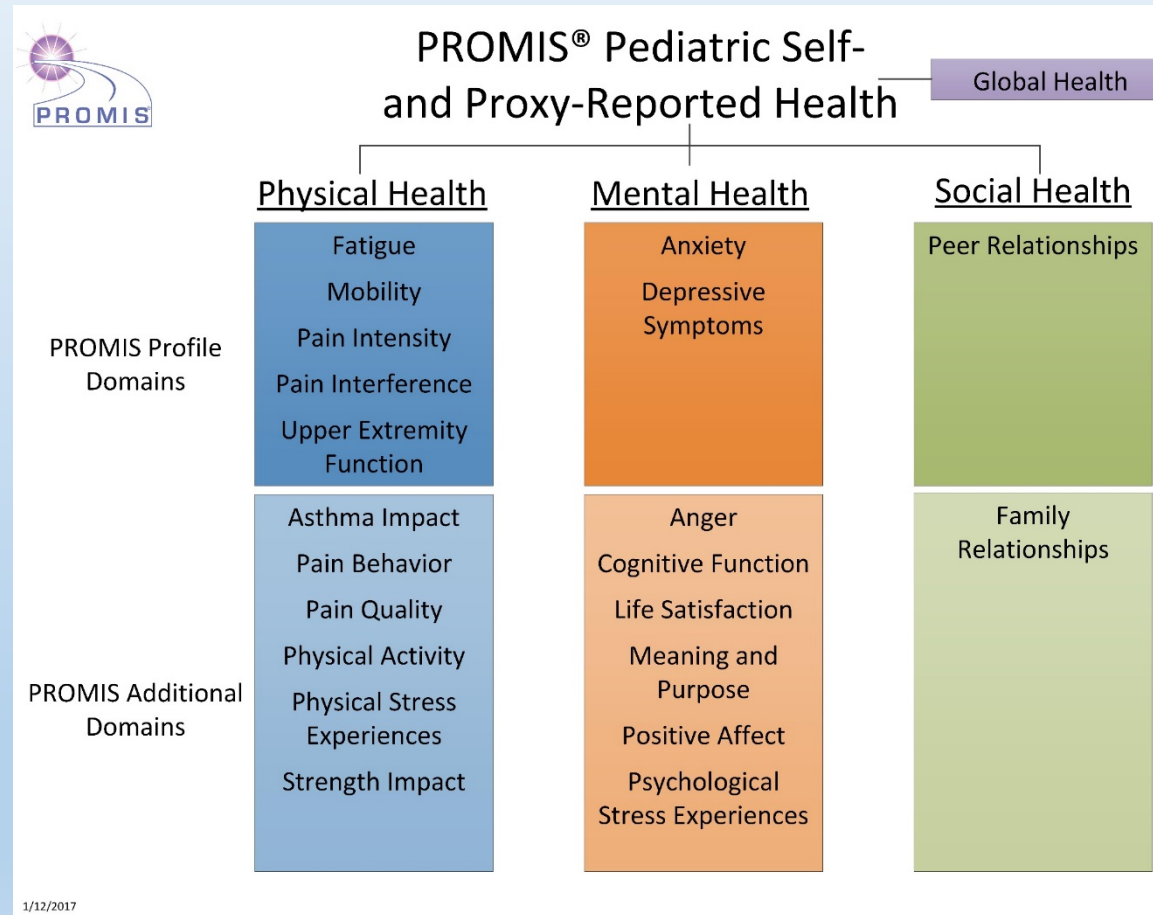
- A project to build and validate common, accessible [item banks](#)
- To measure key symptoms and health concepts applicable to a range of chronic conditions
- Enabling efficient and interpretable clinical trial and clinical practice applications of **PROs**
- Supported by the NIH

<http://www.nihpromis.org/>

Domains for Adult Assessment



Domains for Pediatric Assessment



PROMIS Depression domain

The screenshot shows a Microsoft Internet Explorer browser window displaying a survey page. The address bar shows the URL: `http://204.26.30.69/PROMIS/Default.aspx?SID=5D749A1A-46FD-4E7D-BBFF-08D644DDF9D4`. The page header includes the PROMIS logo and a navigation bar. The main content area displays the following text:

Section 9 of 17

In the past 7 days

It was difficult to let people know I was angry

Never

Rarely

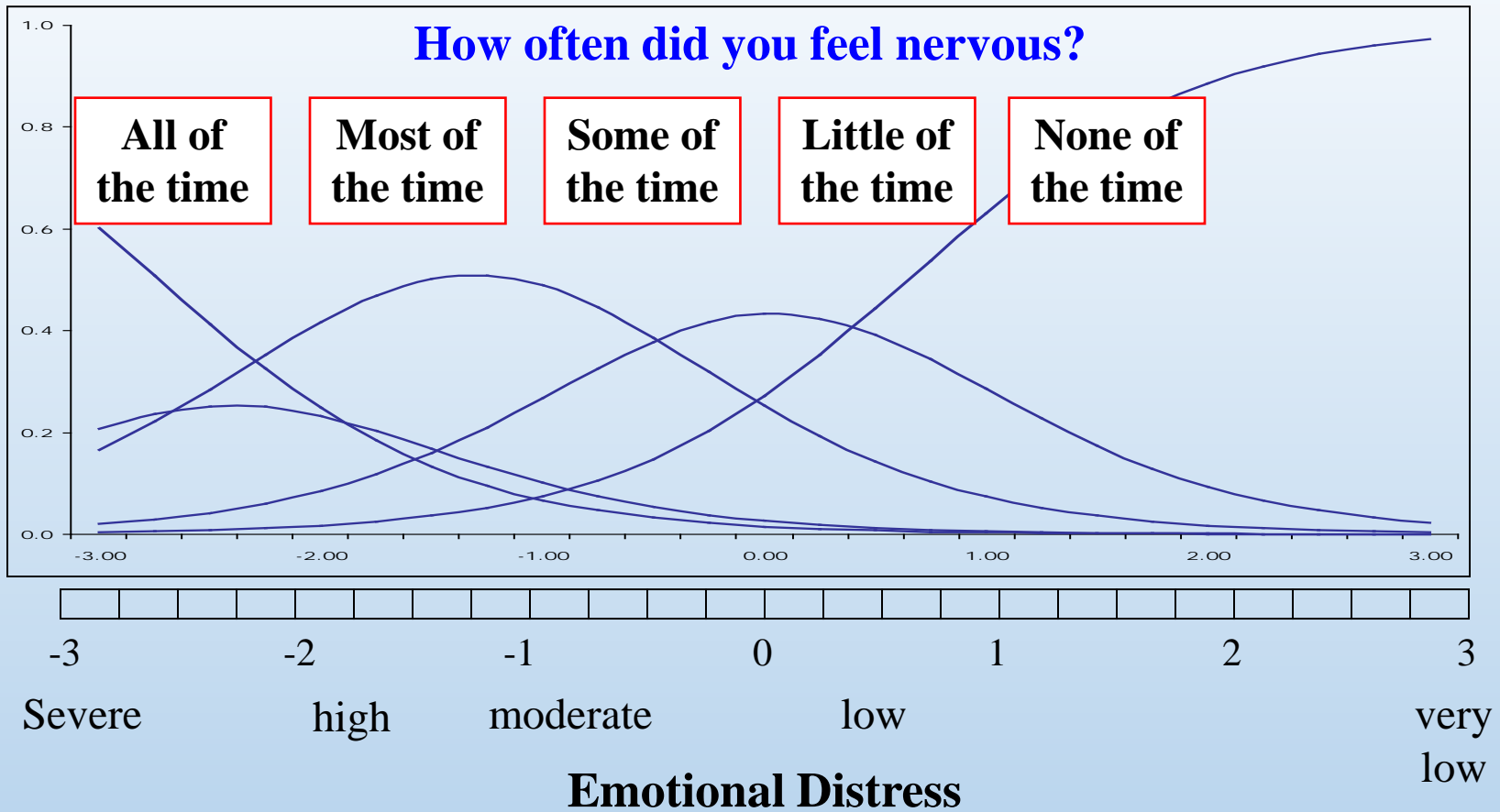
Sometimes

Often

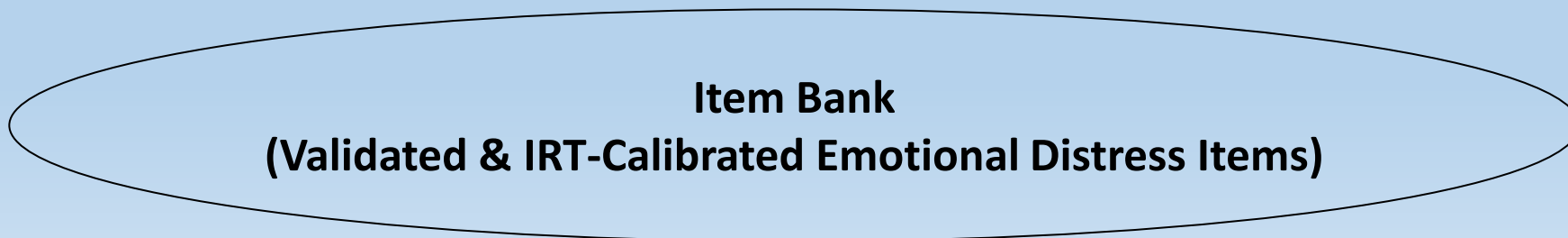
Always

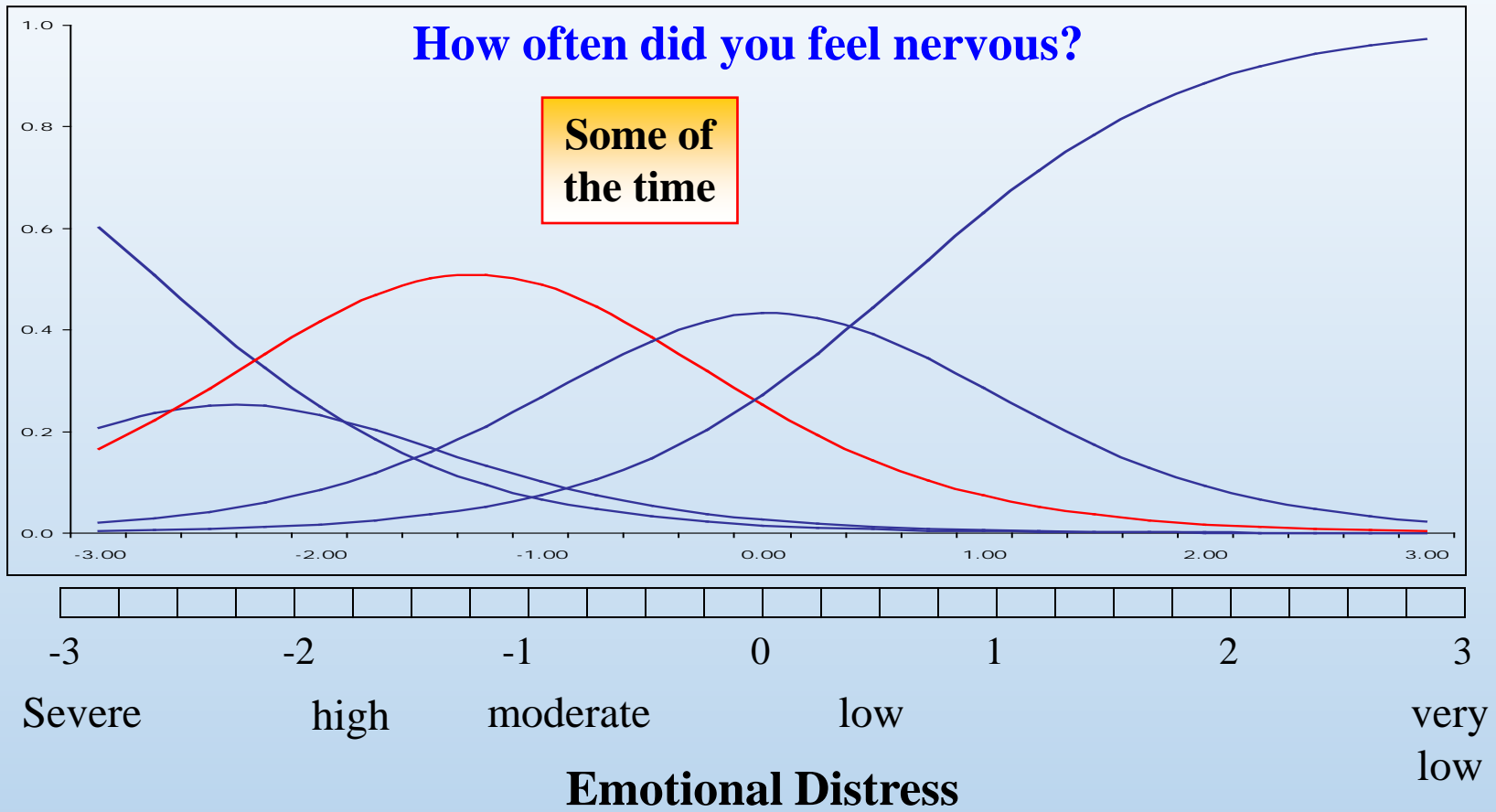
At the bottom of the question area, there are three buttons: **Back**, **Continue**, and **Exit Survey**.

The browser's taskbar at the bottom shows the Start button, several application icons, and the system tray with the time 3:24 PM.

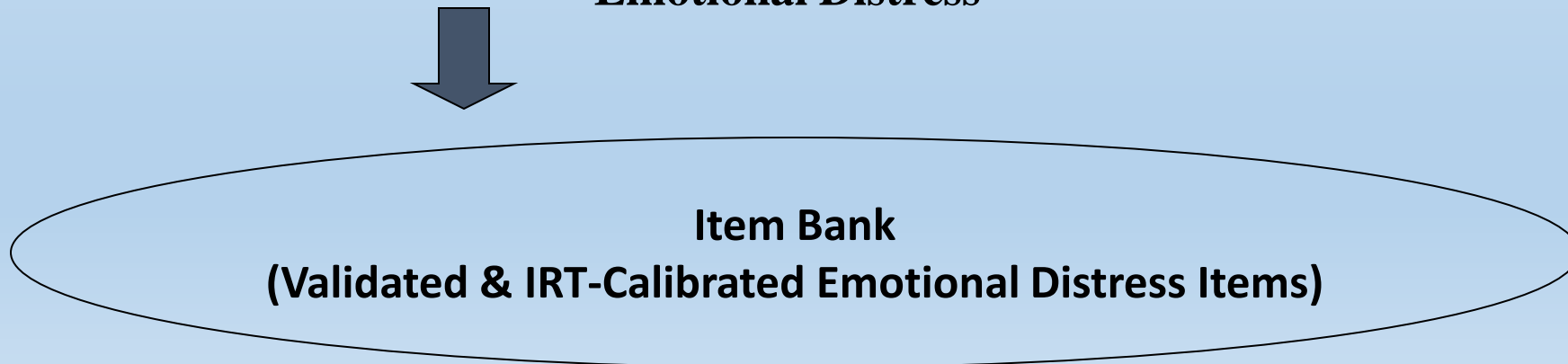
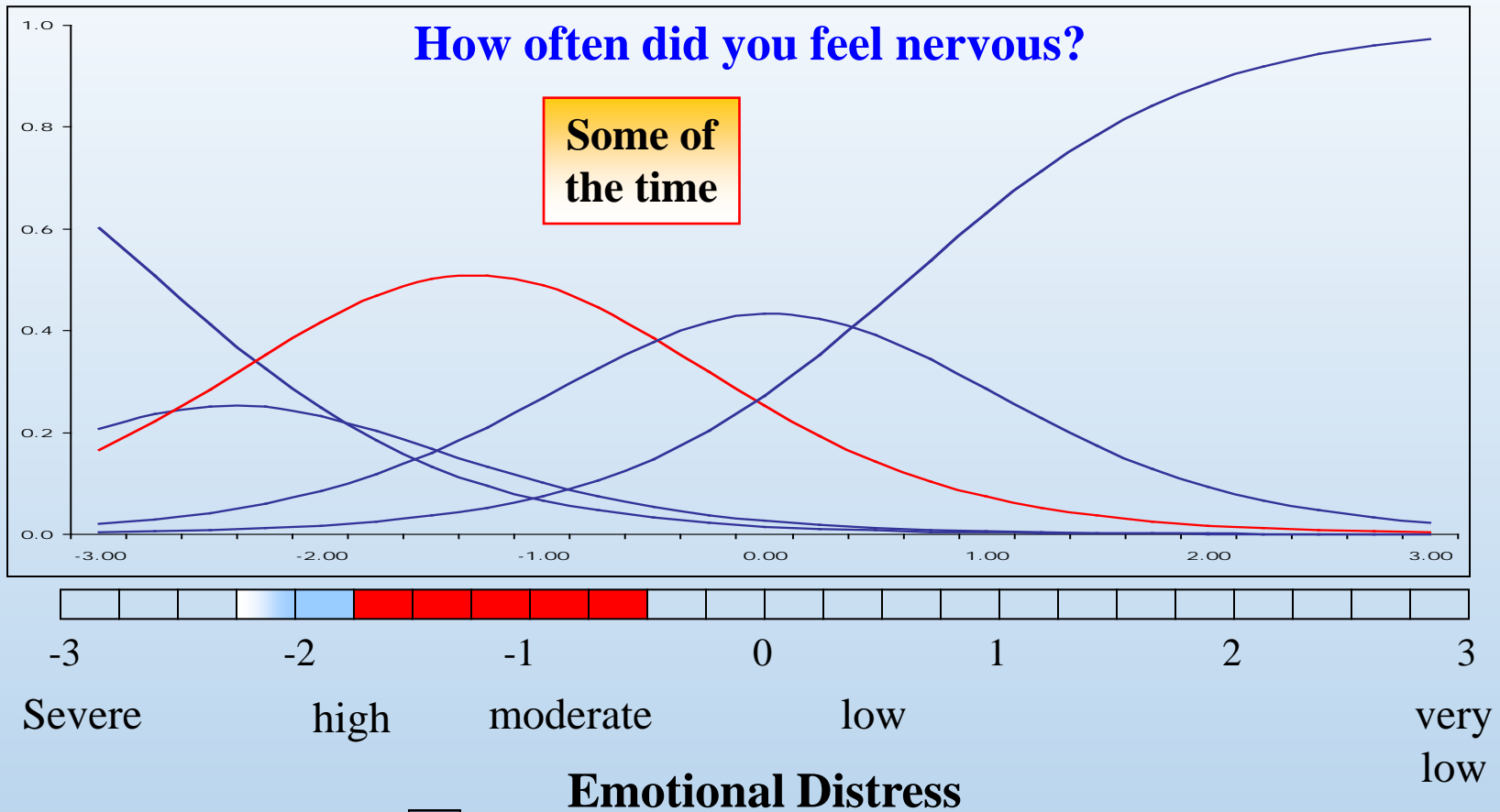


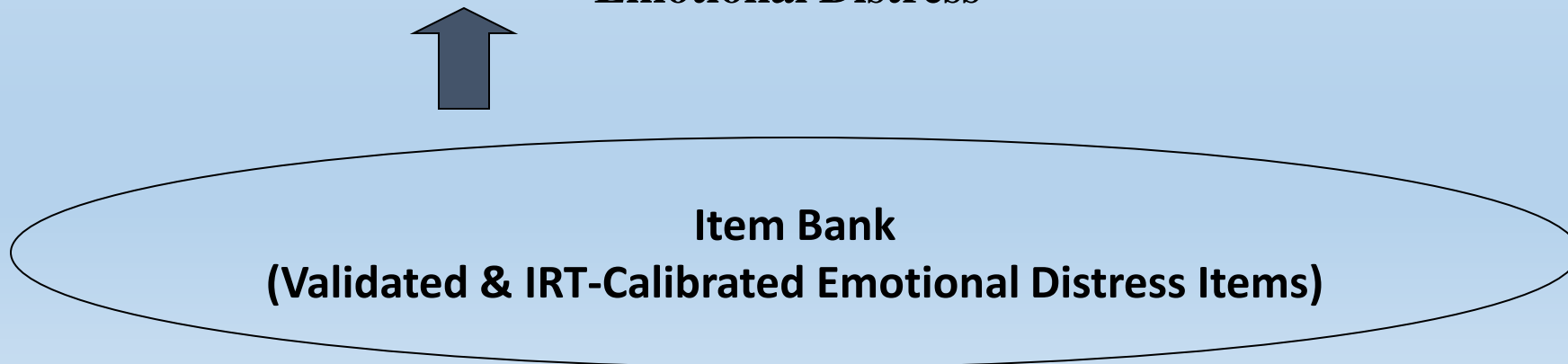
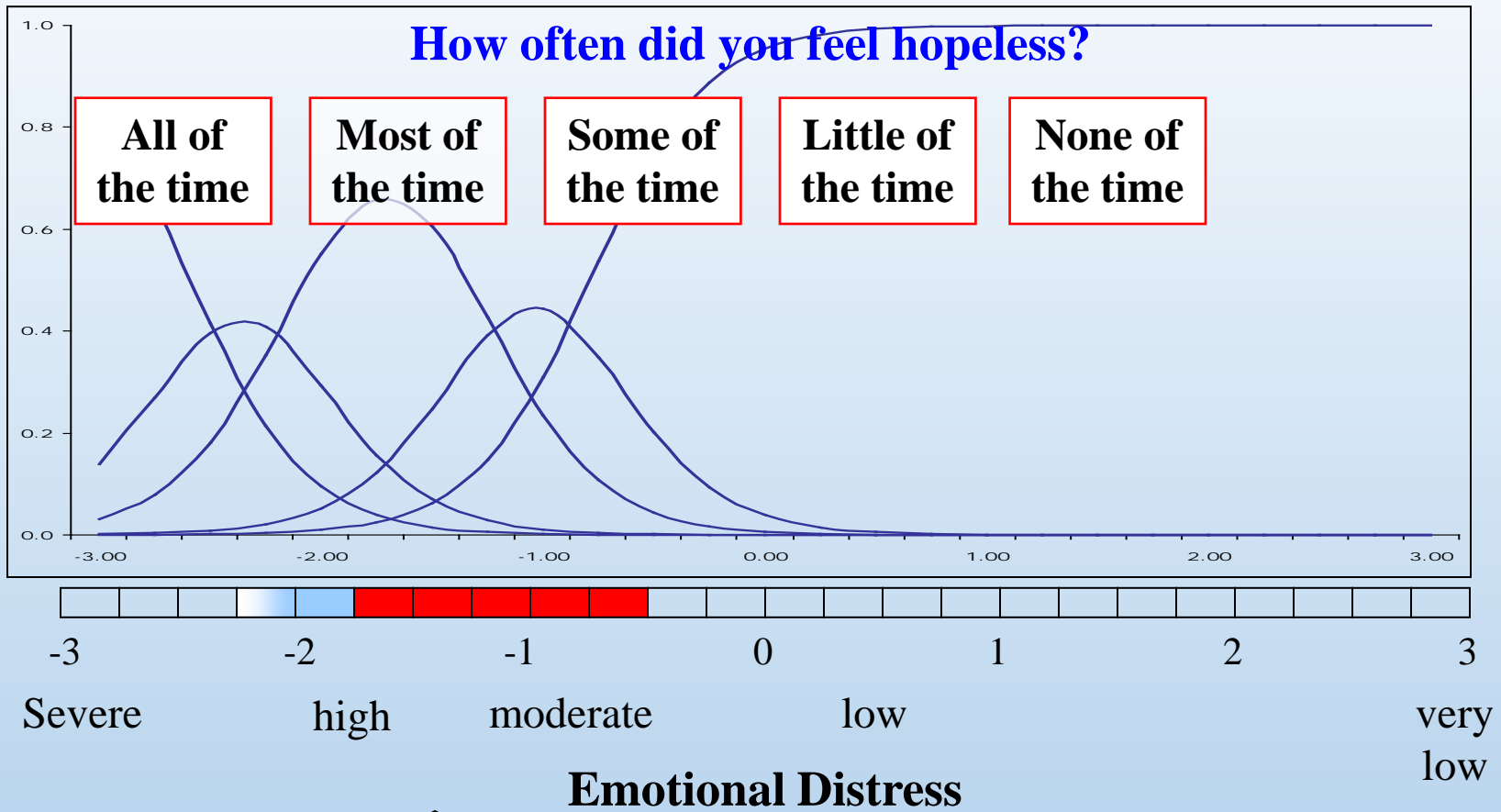
Emotional Distress

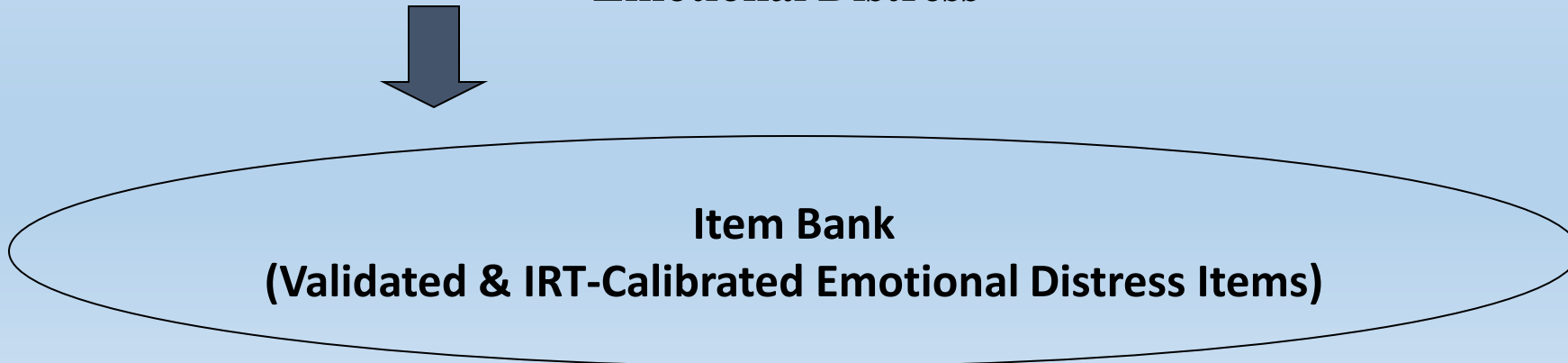
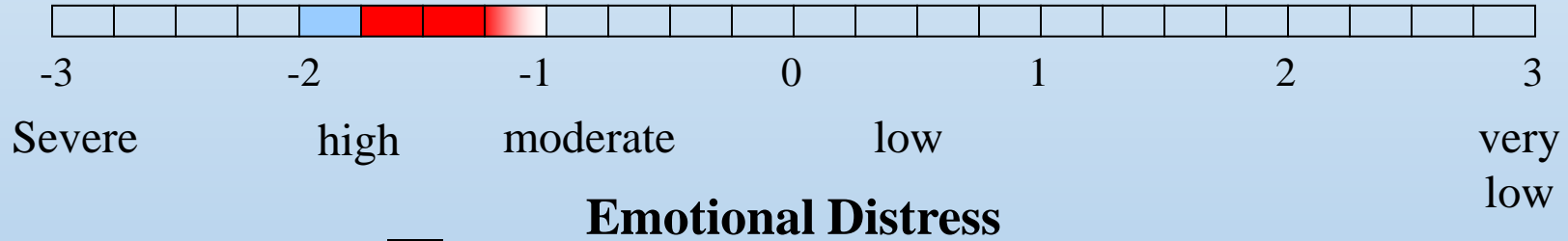
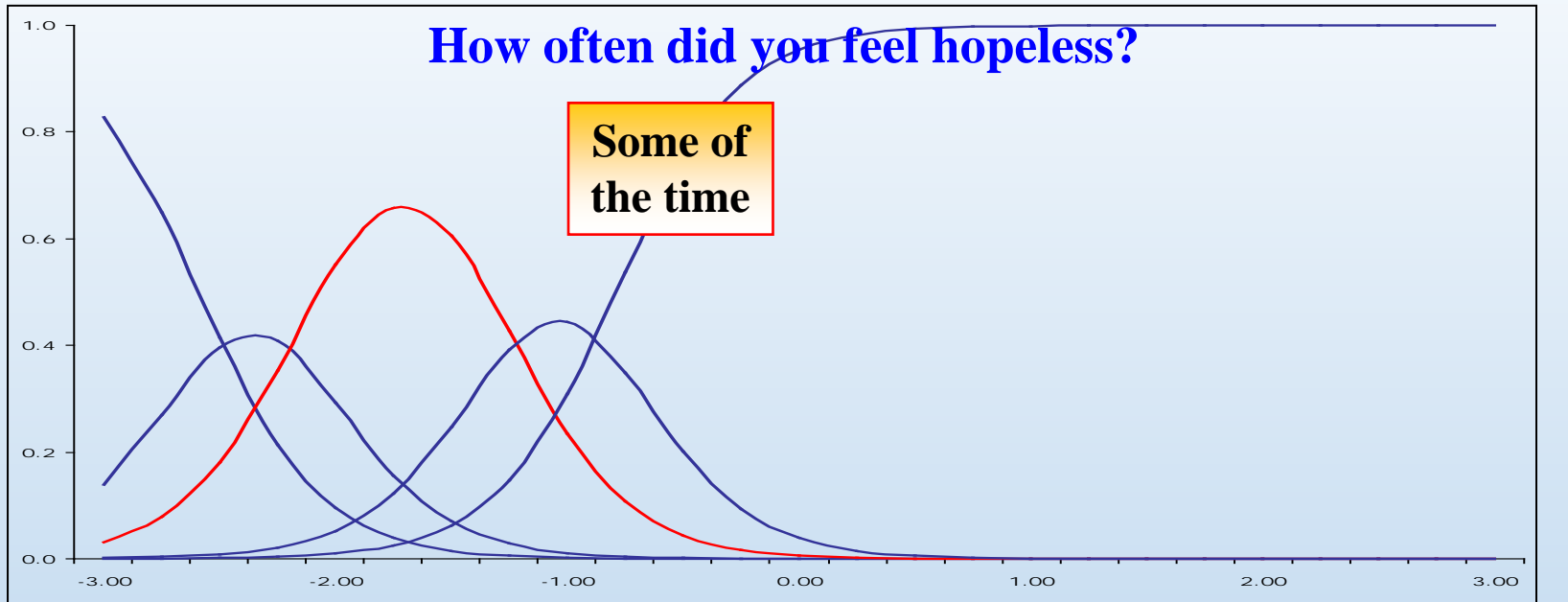


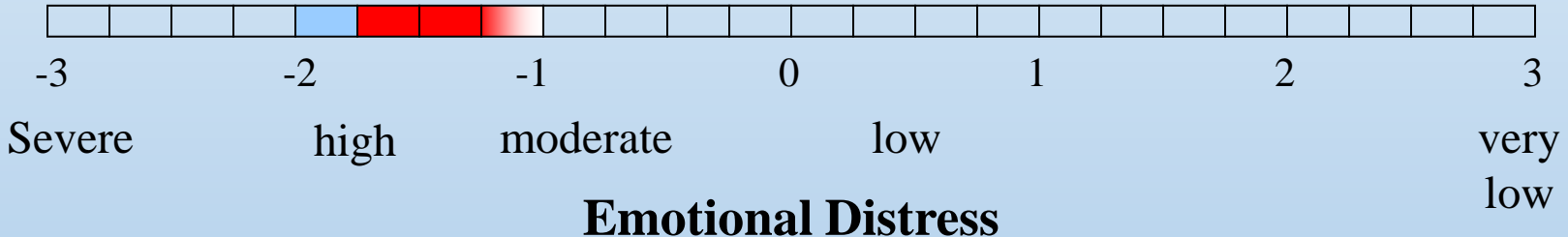
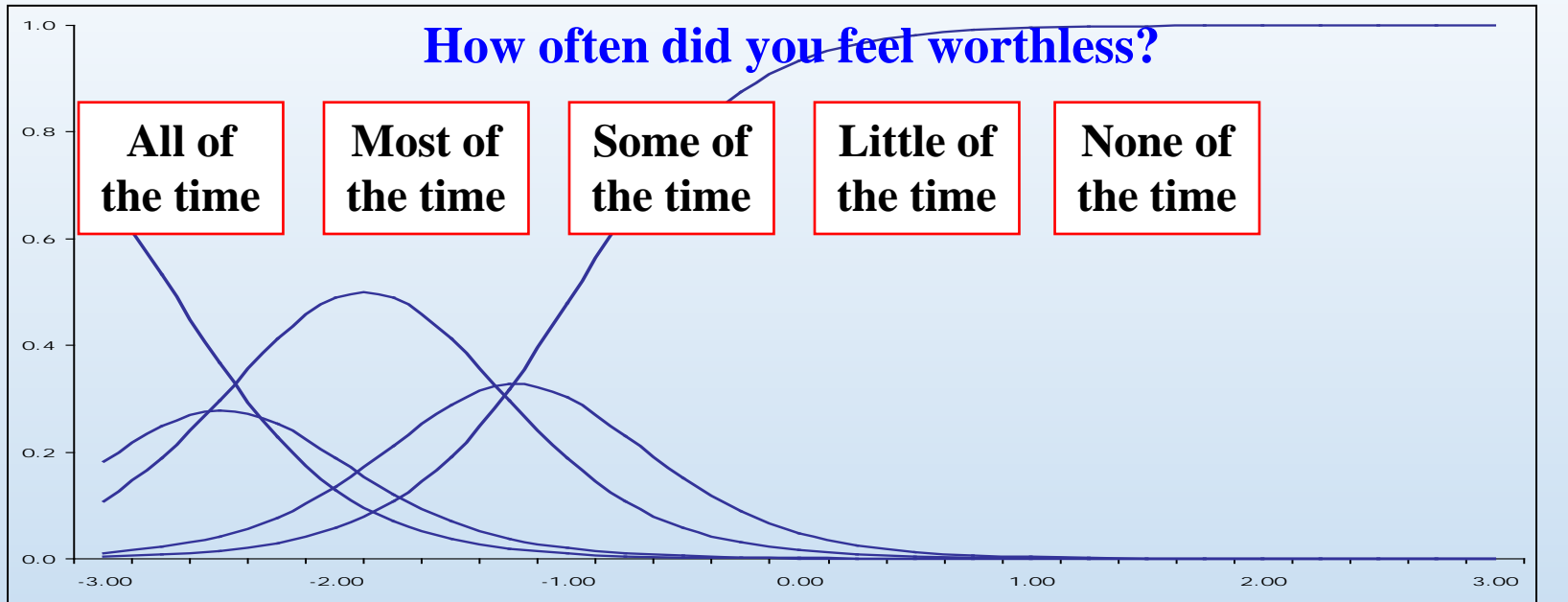



Item Bank
(Validated & IRT-Calibrated Emotional Distress Items)

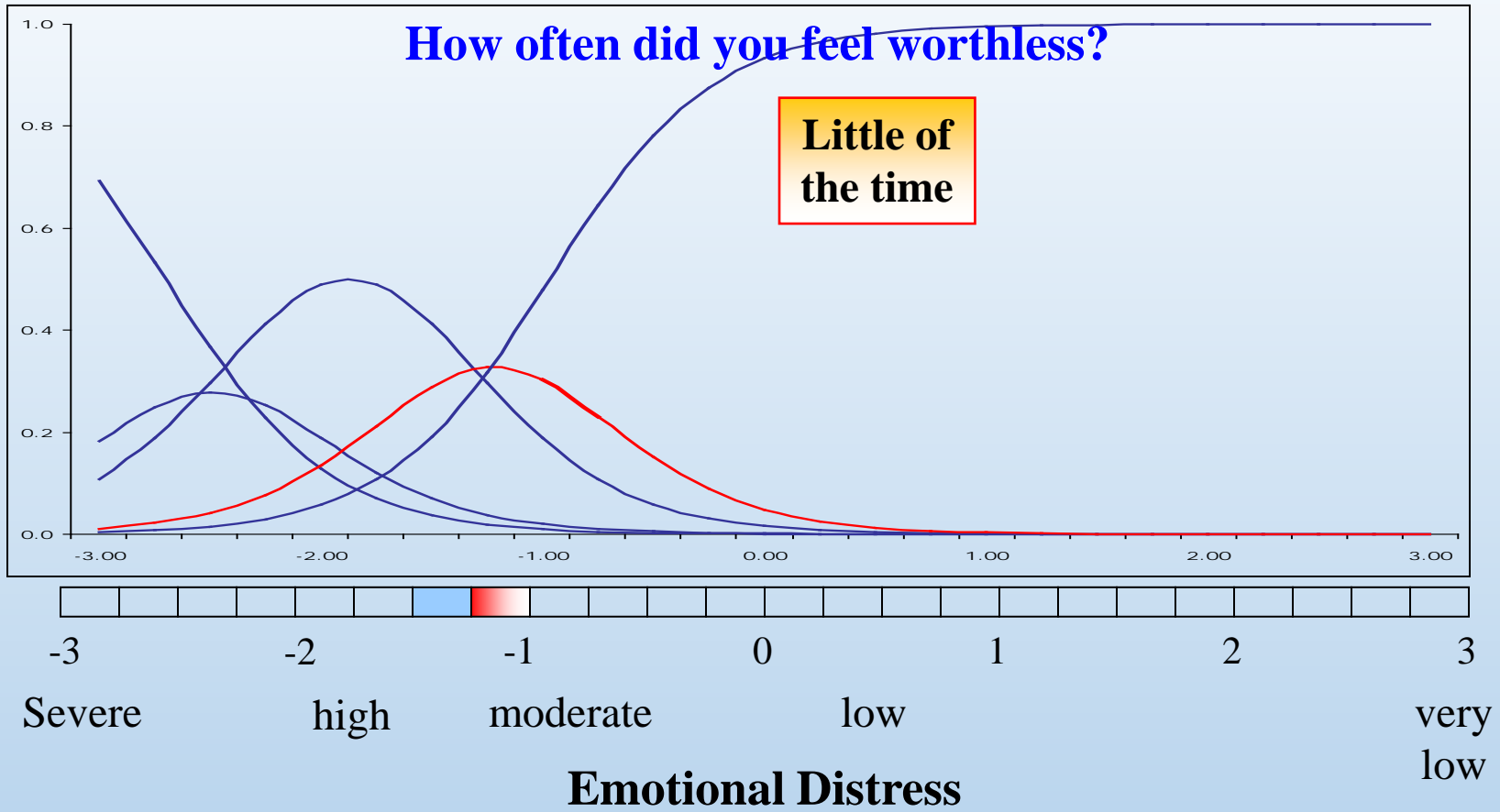




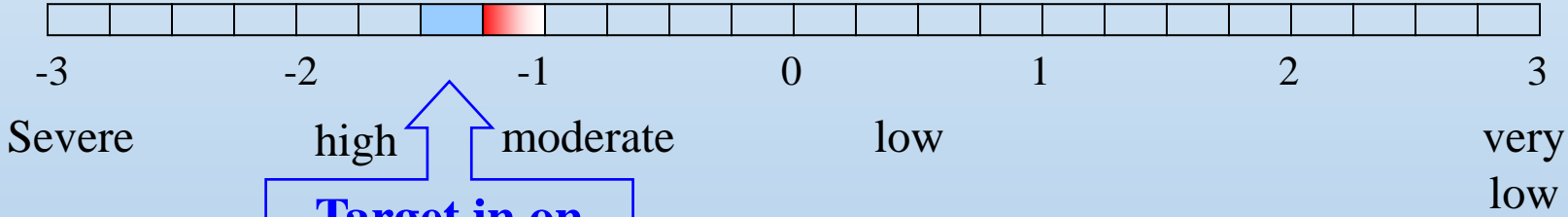





Item Bank
(Validated & IRT-Calibrated Emotional Distress Items)



Item Bank
(Validated & IRT-Calibrated Emotional Distress Items)



**Target in on
emotional
distress score**

**Item Bank
(Validated & IRT-Calibrated Emotional Distress Items)**

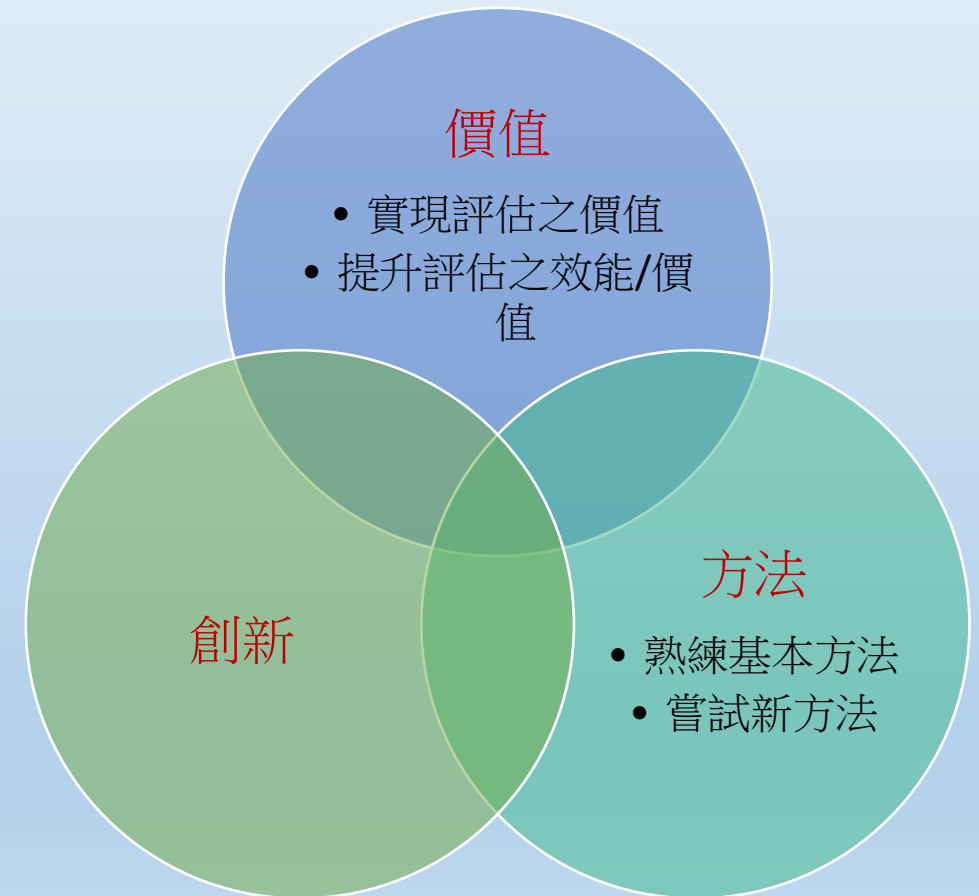
Questions?

已驗證/改良/發展之評估工具範疇 (stroke)

- ADL
- Hand function
- Balance
- Motor
- Mobility (including walking speed)
- QOL (including utility)
- Cognition
- SDM (including health literacy, engagement, SDM process & outcomes)

研究議題的點-線-面-空間發展 學術與臨床價值之實現與提升

- 驗證/比較評估工具
 - 改良評估工具
 - 發展評估工具
 - 改良電子病歷*
 - 理論/模型之建構與修改
- *人力或AI



Q：OT品質與效能之影響因素

詳細/精準評估/
檢查

- 完整/良好的評估工具與技術

合理的治療目標

- 以個案為中心
- 可達成/有效率

實證的治療計畫

- Evidence
- 對症下藥

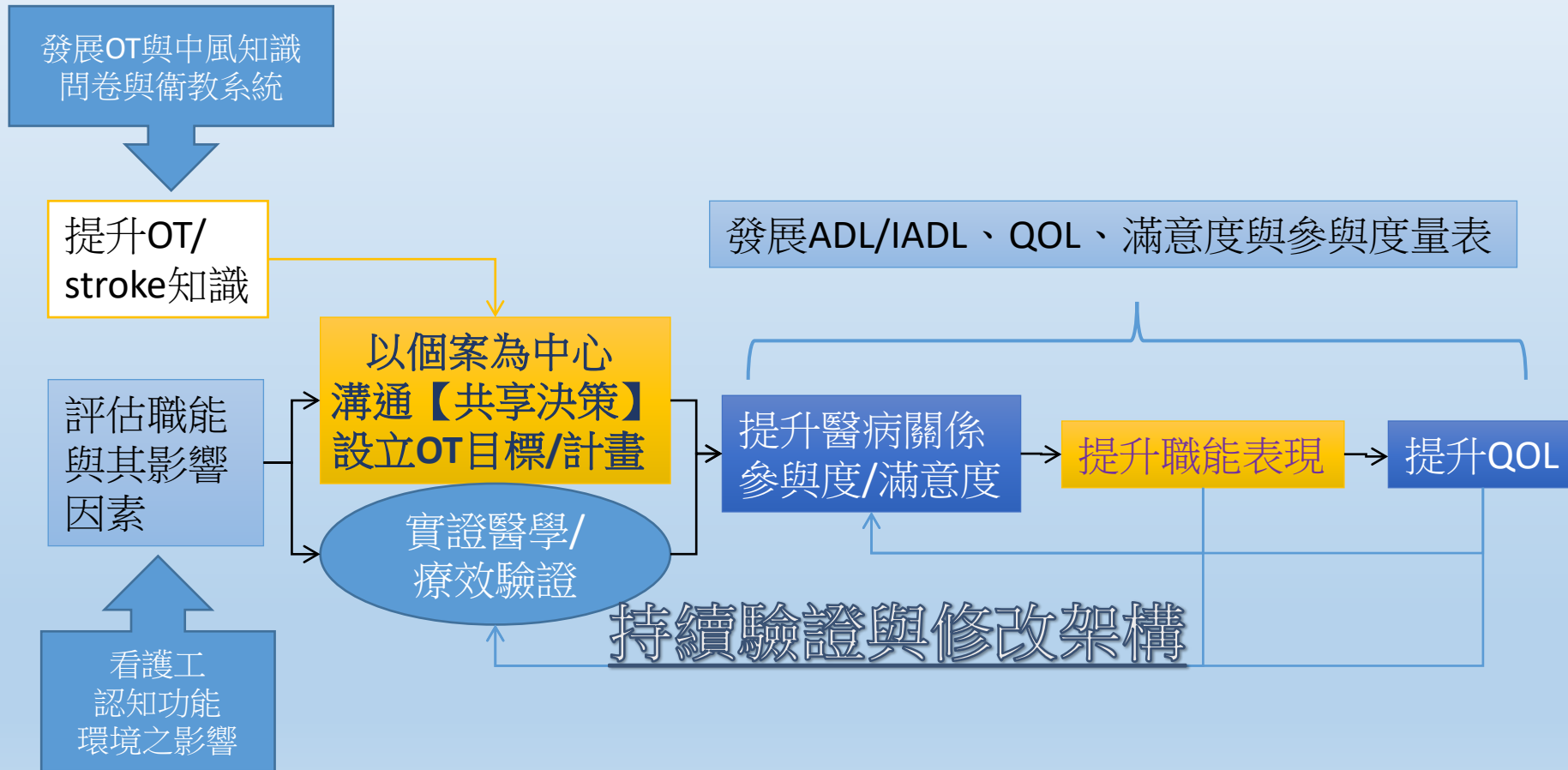
良好的醫病溝通/
衛教

- SDM/Patient Decision Aid (PDA)

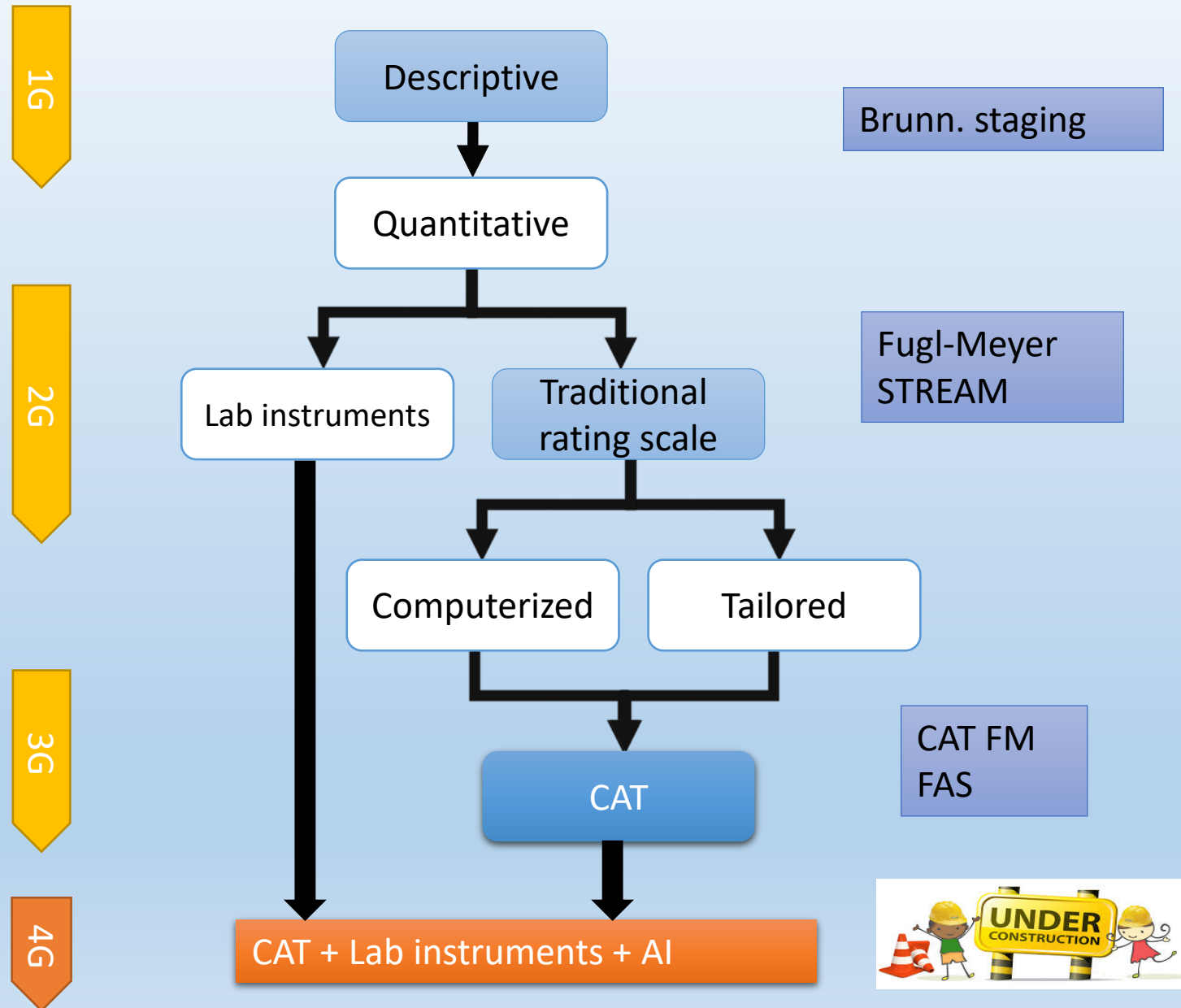
+ 個案/家屬之投入

提升中風病人職能表現之架構

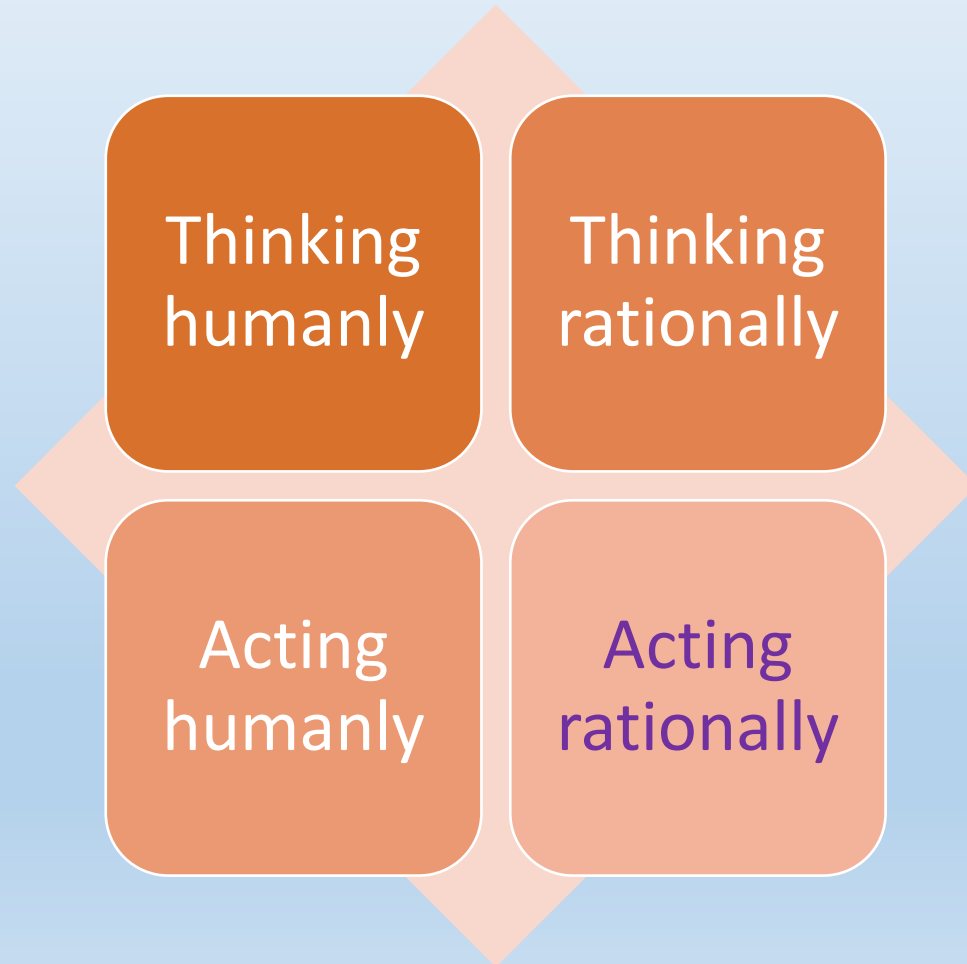
職能之訓練理論與成效驗證



Revolution of Clinical measures



What is AI?





Google in Health

Google is making significant investments in health, wellness, and life sciences. Here are some of the teams focusing efforts in this space:

- Google Cloud
 - Apigee Health APIs
 - G Suite for Healthcare for HIPAA compliant workloads
 - Google Cloud Platform for HIPAA compliant workloads
 - Google Genomics
- Google Fit
- Google Search (e.g., health cards, symptom search)
- Google Research (focused on healthcare applications)

As Amazon moves into health care, here's what we know — and what we suspect — about its plans

- Amazon is already making moves in health care.

Intel[®] Healthcare Solutions: Driving Innovation to Improve Quality

以醒目的方式，看顧你的健康。

「健康」app，讓你輕鬆瞭解自己的健康狀況，並開始朝著目標前進。它能整合來自 iPhone、Apple Watch 與你已在使用的第三方 app 的健康資料，全部匯聚於一處，便於查看你的所有進度。同時也會建議其他實用的 app，來完善你的收藏。讓你的健康更進一步，從未如此容易。

Deep Learning Based Diagnostics: Unlocking a \$16 Billion Market

December 22, 2016 | by James Wang, ARK Analyst | Digital, Health


Mentioned Companies: IBM

Tags: cancer, deep learning, diagnostics, machine learning, radiology

MedicalStartups

SEARCH

Top 83 AI startups in Healthcare

Updated: November 02, 2018  Нравится 1

AI自動建構電子病歷 & 臨床貢獻/研究題材

疾病預後與危險
因子探索

* 各種功能特質
之恢復模型建立

相關理論驗證與
發展

* 評估工具驗證
與發展

臨床決策輔助系
統之發展

◆ 其它(治療師
專長之確認)

先驅/探索/驗證
型研究

個案數越多，
變項越多，
數值精準，價值越高

AI 需多少時間--評估、記錄、預測&報告?

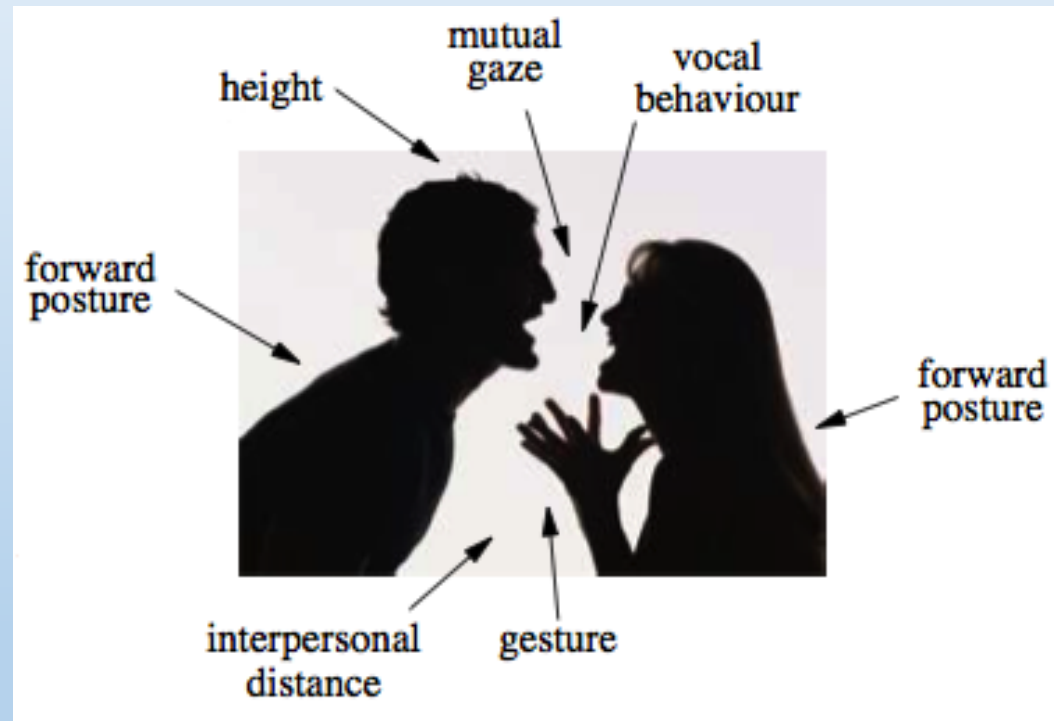
- 治療師評估
 - Impairment + activity = 10+ & 2+ hours
- 個案/家屬自評
 - Activity + Participation + HRQOL + Needs + Knowledge = 10+ & 2+ hours

研究團隊：訓練AI

一般使用者：只需安裝APP/硬體 & 判斷/確認/教導AI

我將如何以 AI 評估 動作/行為/語言/情緒

- Video-audio
 - 專業級
 - 一般級
- 自然情境之評估為主
 - 接受OT時
 - 未接受OT時
 - 指定情境
- 標準化情境之評估為輔
- 專業人員確認



Videotaping + AI (clinical site + ward) I

- Motor
- Balance
- Mobility
- Gait
- ADL
- Attention



Videotaping (clinical site + ward) II

- Communication/interaction
- Empathy
- SDM
- Engagement
- Mood
- Knowledge
- Attitude



Videotaping (clinical site + ward) III

- For staff training (career development)
- Selective
- Voluntary
- Compulsory



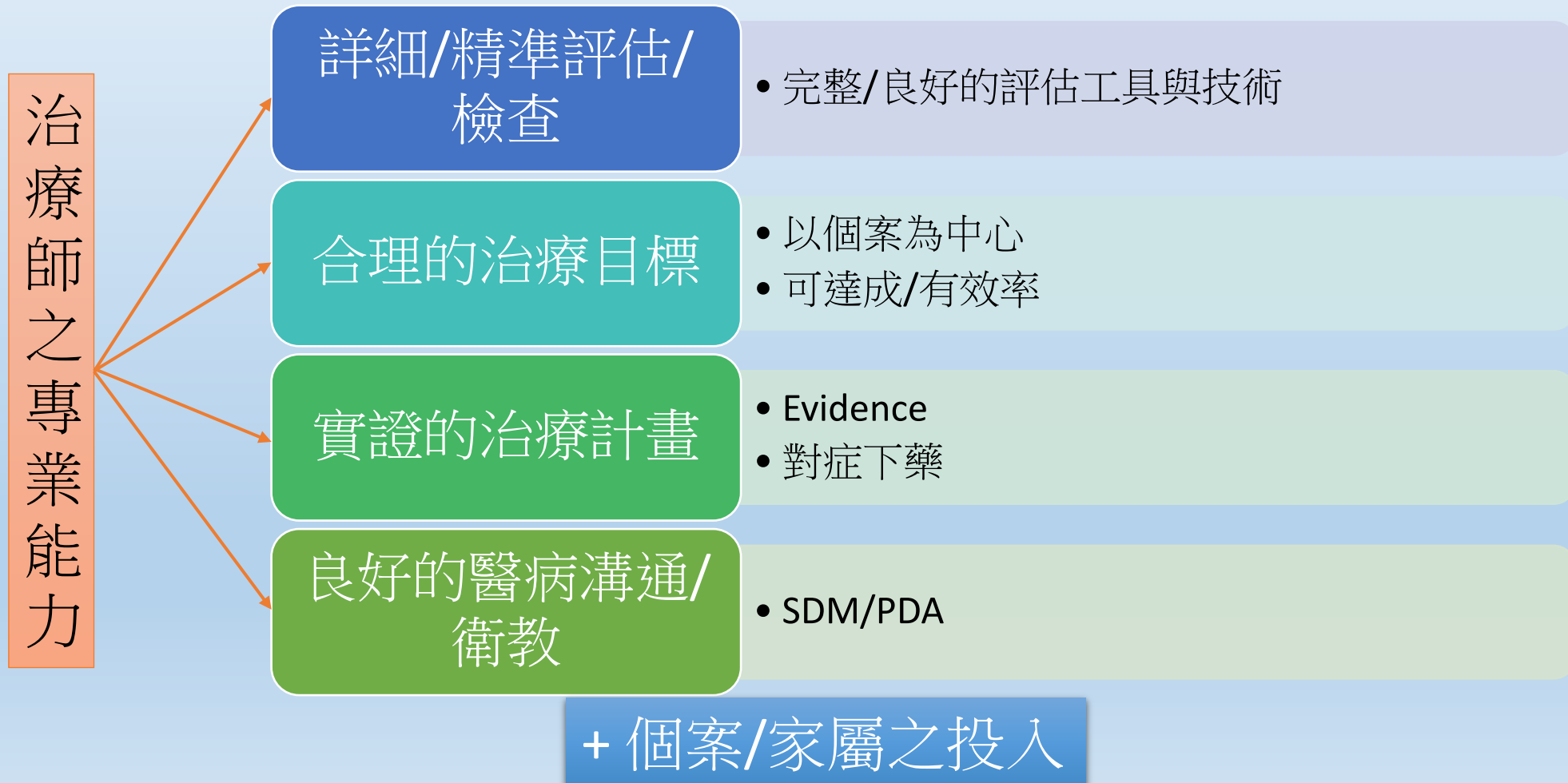
現場錄影 + AI + 電子病歷

醫療決策
輔助系統

醫療人員
訓練

品質與效
能提升

Q：OT品質與效能之影響因素



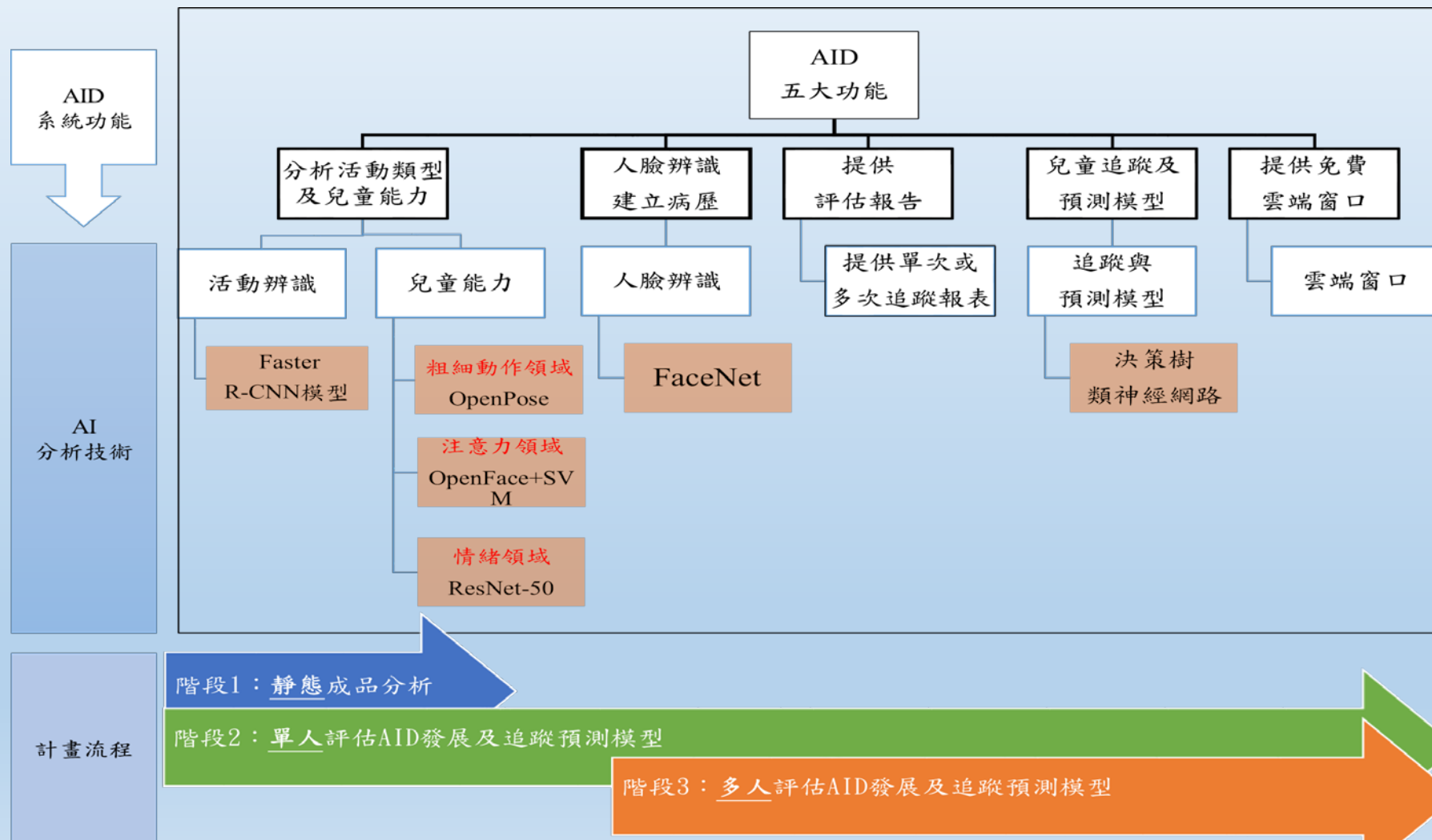
AI 評估系統之發展/整合計畫

1. 發展中風患者動作、平衡及行走能力之AI評估系統
2. 發展認知評估之AI系統於思覺失調症患者
3. 兒童AI評估平台(AID)之發展方向與挑戰





AID預期架構



預期輸出報告-多次評估結果 (預測模型)



長期評估報告




姓名：陳小美
生理年齡：5歲



| 評估日期 | A.細動作 | B.粗動作 | C.情緒 | D.注意力 | E.運筆 |
|-------------------|-------|-------|----------------|----------------|------|
| OLD 2018.11.01 | 🔴 | 🟡 | 🔴 80% 🟢 20% | 🔴 50% 🟢 50% | |
| 2019.01.01 | | 🟡 | 🔴 50% 🟢 50% | 🔴 25% 🟢 75% | |
| 2019.01.31 | 🟡 | | 🔴 48% 🟢 52% | 🔴 25% 🟢 75% | |
| 2019.04.01 | 🟢 | | 🟢 | 🔴 17% 🟢 83% | |
| 2019.04.20 NEW | 🟢 | | 🟢 | 🔴 17% 🟢 83% | |

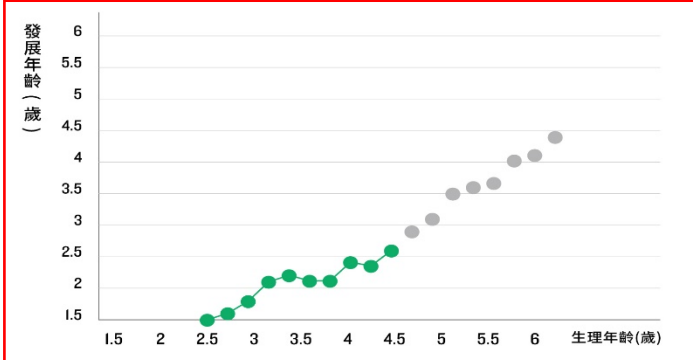
點擊 評估結果報告 後出現的補充資料或重要訊息提醒
點擊 評估日期 可連結至該次評估報告，觀看詳細結果


評估報告詳細結果



A.細動作長期變化

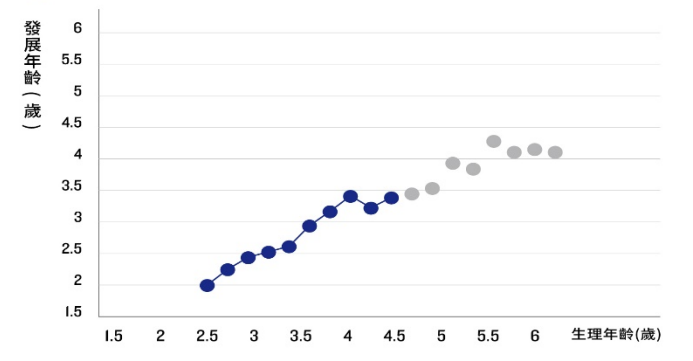
● 評估值 ● 預測值





B.粗動作長期變化

● 評估值 ● 預測值



點選左圖報告內容後展開之頁面

臨床情境提供 兒童多向度發展資訊

行為 ✓

| | |
|---------------------------|--------------|
| 人際互動 | 活動表現 |
| ✓ 表達技巧 同理 親子 / 同儕關係 | 自我照顧 遊戲 ✓ |



生理

| | |
|---------------------------------|---------------|
| 語言 | 動作 |
| ✓ 構音 / 模仿 命名 言語表達 言語理解 | 粗動作 ✓ 精細動作 |

心理 / 社會

| | | | |
|----------------------|----------------------|-------------------------------|-------------|
| ✓ 智能 | ✓ 情緒 | ✓ 認知 | ✓ 靈性 |
| 邏輯推理 抽象思考 知識學習 | 情感表達 情感區辨 情緒控制 | 注意力 記憶力 計畫 / 執行 問題解決 | 個性 氣質 |

AI 同時評估 多種發展向度!

臨床情境提供豐富資訊



- ✓ 1. 病人照護
Patient Care
- ✓ 2. 醫學知識
Medical Knowledge
- ✓ 3. 實務導向之學習 & 改進
Practice-based learning & improvement
- ✓ 4. 人際關係 & 溝通技巧
Interpersonal communication skills
- ✓ 5. 專業精神
Professionalism
- ✓ 6. 醫療體系內之執業
Systems-based practice

AI可協助評估 各種臨床技能!

THE LANCET

Available online 11 October 2018

In Press, Corrected Proof

Comment

The fate of medicine in the time of AI

Enrico Colera

如何準備 AI 時代來臨

- 臨床教育 往數位世界調整
- 臨床人員專精於權衡 AI 建議 vs 其它實證以及個案需求
- 個人化精準醫療將依賴AI估算之預後與治療建議
- 共享決策將成為常態，當病人也有他們的AIs
- AI 將成為您的決策夥伴/助手



THE LANCET

Available online 11 October 2018

In Press, Corrected Proof [?](#)

Comment

The fate of medicine in the time of AI

Enrico Coiera ^a [✉](#)

- We probably see little change to clinical practice in the next 5 years
- We should cert**AI**nly see changes in 10 years
- There is a real prospect of massive change in 20 years

Summary – 研發/掌握最強的工具/輔具 以發展/驗證理論，提升臨床效能

強化專業能力/研究團隊

結合 AI 團隊

教育 AI 駕馭 AI

CAT + AI = 4G 評估工具 可大幅提升評估、記錄與應用效能

AI + 電子病歷

- 醫療決策輔助系統，協助醫病雙方
 - 確認問題/需求
 - 衛教
 - 預後預測
 - 選擇/調整治療目標
 - 選擇/調整治療計畫

AI：進展比你想像的快？

