My Journeys With Job Analysis

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University of Delaware

Ernest J. McCormick Memorial Lecture
Purdue University
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Big Picture Questions

Job analysis lens
In Different Lands

• Sociology

• Intelligence

• Epidemiology

• Human evolution
My Starting Point—Part 1

1. Occupational choice

“What abilities do jobs require?”

Occupations mostly black boxes
Plus other data on jobs:
- DOT
- GATB
- Census
- OAP ratings
- Prestige scales
- Holland scales
- Etc.
1. Occupational choice

“What abilities do different occupations require?”

2. Occupational attainment

“Who gets ahead, and why?”
Sociology’s Claims in the 1970s

• Education predicts job level better than IQ
• Education doesn’t predict job performance
• Ergo, IQ can’t predict job performance
• Ergo, virtually everyone could do all jobs
• Conclusion: Education and IQ do not reflect “merit,” but social class in disguise. It’s a way the ruling classes maintain dominance.
• Generalization: Human inequality is socially constructed, the result of oppression and privilege
IQ Predicts Job Level--Is This Merit at Work, or Oppression?

IQs of applicants for:

- Attorney, Engineer
  - IQs: 108-128
- Teacher, Programmer
  - IQs: 100-120
- Secretary, Lab tech
  - IQs: 96-116
- Meter reader, Teller
  - IQs: 91-110
- Welder, Security guard
  - IQs: 85-105
- Packer, Custodian
  - IQs: 80-100
I/O Had Similar Concerns

• The “criterion problem”
  – Military: ASVAB predicts training, but in jobs too?
  – Civilian: IQ predicts supervisor ratings, but what about objective performance?

• The “adverse impact” standard
  – Education & IQ presumed discriminatory until proved job-related
Does IQ Predict Within-Job Performance?

IQs of applicants for:

Attorney, Engineer
Teacher, Programmer
Secretary, Lab tech
Meter reader, Teller
Welder, Security guard
Packer, Custodian

IQs: Middle 50%

- Attorney, Engineer: 108-128
- Teacher, Programmer: 100-120
- Secretary, Lab tech: 96-116
- Meter reader, Teller: 91-110
- Welder, Security guard: 85-105
- Packer, Custodian: 80-100

Correlations

- 0.8
- 0.5
- 0.2
So What?

• **Why** does IQ predict performance?
• **Why** better prediction at higher levels?
• Just employer tastes—self-fulfilling prophecy?
Occupations Just Black Boxes

• What is a job?
• What tasks make them up?
• Are tasks in higher-level jobs more cognitively demanding?

How would we know?
POSITION ANALYSIS QUESTIONNAIRE

INTRODUCTION

The Position Analysis Questionnaire (PAQ) is a structured job analysis questionnaire that can be used for analyzing positions or jobs of many different types. On the basis of the analysis of any given position/job with the PAQ it is possible to compute statistically-derived job dimension scores, thus making it possible to relate positions or jobs to each other on the basis of such job dimension scores.

ORGANIZATION OF THE QUESTIONNAIRE

The questionnaire is divided into the six major divisions listed below. In addition to the division titles, a "question" is included which can be kept in mind when going through each division.

Divisions:

1. Information Input (Where and how does the worker get the information that is used in performing the job?) Pages 4-7
2. Mental Processes (What reasoning, decision-making, planning, and information processing activities are involved in performing the job?) Pages 7-11
3. Work Output (What physical activities does the worker perform and what tools or appliances are used?) Pages 11-16
4. Relationships With Other Persons (What relationships with other people are required in performing the job?) Pages 16-20
5. Job Context (In what physical and social contexts is the work performed?) Pages 20-23
6. Other Job Characteristics (What activities, routines, or characterstics other than those described above are relevant to the job?) Pages 23-29

The six divisions listed above are further divided into sections and subsections. Each section or subsection is made up of a group of related job elements. Each job element describes some general work activity, work condition, or job characteristic. In most cases examples are given to illustrate the "spirit of" the job element. However, these examples are intended only to help illustrate the idea and represent only a few of the possible examples that could characterize the job element.

Prepared under provisions of Office of Naval Research Contract No. N00014-57-C-0128. Copyright © 1957 by Purdue Research Foundation. All rights reserved. The PAQ and related materials are distributed by the University Book Store, 360 West State St., West Lafayette, Indiana 47906 (317) 743-9010.
JOB DIMENSIONS BASED ON PRINCIPAL COMPONENTS
ANALYSES OF PAQ DATA FOR 2200 JOBS:
SYSTEM II

GENERAL CATEGORIES

OPERATIONAL TITLE

DIVISION DIMENSIONS

Division 1: Information Input

1. Perceptual interpretation
2. Input from representational sources
3. Visual input from devices/materials
4. Evaluating/judging sensory input
5. Environmental awareness
6. Use of various senses

Division 2: Mental Processes

7. Decision making
8. Information processing

Division 3: Work Output

9. Using machines/tools/equipment
10. General body vs. sedentary activities
11. Control and related physical coordination
12. Skilled/technical activities
13. Controlled manual/related activities
14. Use of miscellaneous equipment/devices
15. Handling/manipulating/related

Interpreting what is sensed
Using various sources of information
Watching devices/materials for information
Evaluating/judging what is sensed
Being aware of environmental conditions
Using various senses

Making decisions
Processing information

Using machines/tools/equipment
Performing activities requiring general body movements
Controlling machines/processes
Performing skilled/technical activities
Performing controlled manual/related activities
Using miscellaneous equipment/devices
Performing handling/related
Division 4: Relationships With Other Persons

17. Interchange of judgmental/related information
18. General personal contact
19. Supervisory/coordination/related activities
20. Job-related communications
21. Public/related personal contacts

Division 5: Job Context

22. Potentially stressful/unpleasant environment
23. Personally demanding situations
24. Potentially hazardous job situations

Division 6: Other Job Characteristics

25. Non-typical vs. typical day work schedule
26. Businesslike situations
27. Optional vs. specified apparel
28. Variable vs. salary compensation
29. Regular vs. irregular work schedule
30. Job demanding responsibilities
31. Structured vs. unstructured job activities
32. Vigilant/discriminating work activities
Specific items

30  Estimating speed of processes (estimating the speed of ongoing processes or a series of events while they are taking place, for example, chemical reactions, assembly operations, timing of food preparation in a cafeteria, etc.)

31  Judging condition/quality (estimating the condition, quality, and/or value of objects, for example, antique dealer, appraiser, jeweler, used-car dealer, coin dealer, etc.)

32  Inspecting (inspecting products, objects, materials, etc., either one’s own workmanship or that of others, in terms of established standards, for example, identifying defects, classifying by grade, etc.; do not include here activities described in item 31 above)

33  Estimating quantity (estimating the quantity of objects without direct measurement, including weight, number, volume, etc., for example, estimating the board feet of lumber in a log, the weight of a beam, the number of bacteria in an area by looking through a microscope, etc.)

34  Estimating size (estimating the dimensions of objects without direct measurement, including length, thickness, etc., for example, estimating the height of a tree, judging sizes of boxes or furniture in loading a truck, etc.)

35  Estimating time (estimating the time required for past or future events or work activities, for example, judging the amount of time to make a delivery, estimating the time required to service a worn machine part or piece of equipment, judging the length of time required to change a production line procedure, etc.)

2 MENTAL PROCESSES

2.1 Decision Making, Reasoning, and Planning/Scheduling

36  Decision making (indicate, using the code below, the level of decision making typically involved in the job, considering: the number and complexity of the factors that are taken into account; the variety of alternatives available; the consequences and importance of the decisions; the background experience, education, and training required; the precedents available for guidance; and other relevant considerations. The examples given for the following codes are only suggestive.)

<table>
<thead>
<tr>
<th>Code</th>
<th>Level of Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very limited (“decisions” such as those in selecting parts in routine</td>
</tr>
</tbody>
</table>
# Major Distinction in Task Demands? Complexity

<table>
<thead>
<tr>
<th>Complexity</th>
<th>$r$</th>
<th>Tasks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex</td>
<td></td>
<td>Self-direction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.88</td>
<td>Reason</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.86</td>
<td>Update knowledge</td>
<td></td>
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<tr>
<td></td>
<td>.85</td>
<td>Analyze</td>
<td></td>
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<tr>
<td></td>
<td>.83</td>
<td>Lack of structure</td>
<td></td>
</tr>
<tr>
<td>Simple</td>
<td>.79</td>
<td>Criticality of position</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.71</td>
<td>Transcribe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.51</td>
<td>Recognize</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.36</td>
<td>Repetitive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-.49</td>
<td>Physical exertion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-.56</td>
<td>Supervision</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-.73</td>
<td>Supervision</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Combine information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Advise</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Write</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negotiate, Persuade</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Coordinate</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Instruct</td>
<td></td>
</tr>
</tbody>
</table>
Another Job Analysis, Same Complexity Factor

<table>
<thead>
<tr>
<th>Reasoning &amp; Judgment Factor (Arvey)</th>
<th>$r$ with factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn and recall relevant information</td>
<td>.75</td>
</tr>
<tr>
<td>Reason and make judgments</td>
<td>.71</td>
</tr>
<tr>
<td>Deal with unexpected situations</td>
<td>.69</td>
</tr>
<tr>
<td>Identify problem situations quickly</td>
<td>.69</td>
</tr>
<tr>
<td>React swiftly when unexpected problems occur</td>
<td>.67</td>
</tr>
<tr>
<td>Apply common sense to solve problems</td>
<td>.66</td>
</tr>
<tr>
<td>Learn new procedures quickly</td>
<td>.66</td>
</tr>
<tr>
<td>Be alert &amp; quick to understand things</td>
<td>.55</td>
</tr>
</tbody>
</table>

$g$ (IQ): A general ability to learn, reason, and solve problems.
Like Detective Building Case
## Complexity is Active Ingredient in IQ Items, Too

<table>
<thead>
<tr>
<th></th>
<th>Easy</th>
<th>Moderate</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fill in the next two numbers</strong></td>
<td>3, 5, 7, 9, __, __</td>
<td>3, 5, 6, 8, 9, __, __</td>
<td>10, 9, 8, 9, 8, 7, __, __</td>
</tr>
<tr>
<td><strong>Name one similarity</strong></td>
<td>orange—banana (93%)</td>
<td>table-chair (55%)</td>
<td>fly-tree (18%)</td>
</tr>
<tr>
<td><strong>Define the word</strong></td>
<td>breakfast (99%)</td>
<td>reluctant (50%)</td>
<td>encumber (19%)</td>
</tr>
</tbody>
</table>

% = % of 16-65 year-olds getting at least partial credit for answer, WAIS, 1955
Conclusion

- Complexity is key distinction among jobs
- $g$ is ability to deal with complexity
- Other things matter, but $g$ is chief organizing principle in division of labor
- There is a ecological reality, beyond social intent
What About “Jobs” in Daily Life?

- Driving
- Accounting
- Teaching
- Caregiving
- Carpentry

Daily Self-Maintenance
## Functional Literacy (NALS)

### Why the fed’s concern?

<table>
<thead>
<tr>
<th>NALS Level</th>
<th>% pop. (white)</th>
<th>Simulated Everyday Tasks</th>
</tr>
</thead>
</table>
| 5          | 4%             | - Use calculator to determine cost of carpet for a room  
|            |                | - Use table of information to compare 2 credit cards |
| 4          | 21%            | - Use eligibility pamphlet to calculate SSI benefits  
|            |                | - Explain difference between 2 types of employee benefits |
| 3          | 36%            | - Calculate miles per gallon from mileage record chart  
|            |                | - Write brief letter explaining error on credit card bill |
| 2          | 25%            | - Determine difference in price between 2 show tickets  
|            |                | - Locate intersection on street map |
| 1          | 14%            | - Total bank deposit entry  
|            |                | - Locate expiration date on driver’s license |
## Functional Literacy (NALS)

Like items in life’s “test”?

<table>
<thead>
<tr>
<th>NALS Level</th>
<th>% pop. (white)</th>
<th>Simulated Difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4%</td>
<td>Use calculator to use eligibility panel (abstractness)</td>
</tr>
<tr>
<td>4</td>
<td>25%</td>
<td>Use eligibility panel</td>
</tr>
<tr>
<td>3</td>
<td>36%</td>
<td>Calculate miles per hour</td>
</tr>
<tr>
<td>2</td>
<td>25%</td>
<td>Determine difference</td>
</tr>
<tr>
<td>1</td>
<td>14%</td>
<td>Total bank deposit</td>
</tr>
</tbody>
</table>
Motor Vehicle Fatalities. Are They Just “Accidental”?

• IQ is best predictor
• Predicts net of 56 other variables
• Think: What makes driving complex?

<table>
<thead>
<tr>
<th>Australian veterans followed to age 40</th>
<th>Death rate per 10,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQ: above 115</td>
<td>51.3</td>
</tr>
<tr>
<td>100-115</td>
<td>51.5</td>
</tr>
<tr>
<td>85-100</td>
<td>92.2</td>
</tr>
<tr>
<td>80- 85</td>
<td>146.7</td>
</tr>
</tbody>
</table>

2x

3x
Daily Life is Full of Hazards

You IDIOT! You were shaving and using your Palm Pilot instead of driving!

If you hadn't been sending a fax while playing with your GPS system, you MORON!
Common Building Blocks of Task Complexity—All Around You!

- **Individual tasks**
  - Abstract, unseen processes; cause-effect relations
  - Incomplete or conflicting information; much information to integrate; relevance unclear
  - Inferences required; operations not specified
  - Ambiguous, uncertain, unpredictable conditions
  - Distracting information or events
  - Problem not obvious, feedback ambiguous, standards change

- **Task constellation** *(Often neglected, even in job analyses)*
  - Multi-tasking, prioritizing
  - Sequencing, timing, coordinating
  - Evolving mix of tasks

Intelligence a useful tool in everyday life
Health Inequality: Claims Today

• Education & income correlated with illness & injuries
• Assumption: They provide access to more & better care
• Assumption: People alike, only external conditions differ
• Conclusion: Health would be same if resources equal
• Generalization: Human inequality is socially constructed, the result of oppression and privilege
• Recommendation: Diversity training, equalize access and resources

Sound familiar?
But Doesn’t Fit the Evidence

- SES-health relation too general
- Relation is too linear
- Gaps grow when they should shrink

- So, search is on for a “fundamental cause”—perhaps inequality itself sickens & kills
Contributing Behaviors

Even when care is free:

• Lower social classes seek:
  – Less information
  – Less preventive care
  – More—but less appropriate—curative care

• And perform worse:
  – Know, understand less
  – Less healthy behavior (e.g., smoking)
  – Adhere less to treatment regimens

So what? Could still be lack of opportunity and resources.
Non-Work **Accidental** Death Rates Higher in Lower Classes

<table>
<thead>
<tr>
<th>Category</th>
<th>Relative Risk</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suffocation (infants)</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>Choking on food (infants &amp; elderly)</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Drowning (young males)</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Motor vehicle (young males)</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Fires/burns (children &amp; elderly)</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Lightning (young males)</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>Firearms (young males)</td>
<td>4.4</td>
<td>So what?</td>
</tr>
<tr>
<td>Natural disasters (all ages, sexes)</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Exposure/neglect (infants &amp; elderly)</td>
<td>7.4</td>
<td></td>
</tr>
</tbody>
</table>
IQ Predicts Health Better Than SES

Large, prospective IQ-SES-health studies

- Scotland (IQ at age 11)
  - Longevity
  - Heart disease, lung cancer mortality
  - Smoking cessation

- Australia (IQ at Army induction)
  - All-cause mortality
  - Motor vehicle deaths
  - Suicide

So what?
Think—Who is your primary health care provider?
“Mortality could be reduced substantially if people at risk would change just five behaviors.”
- adherence to medical recommendations
- diet
- smoking
- lack of exercise
- alcohol and drug use (American Psychological Society, 1996)

“Our own decisions throughout life have a greater effect than all the efforts of medical care combined.” (Surgeon General Report, 1979)
Health Self-Care Is a Lifelong Job

• Constellation of tasks to perform, actions to avoid
• Training required
• Coordinate & communicate with others
• Exercise independent judgment
• Only occasional supervision
• Job changes as technology & conditions evolve
• Sometimes tiring, frustrating, affects family life
• Central to personal well-being
• But no vacations, no retirement
Major Forms of Death & Disease

- Chronic illnesses (heart disease, cancer, etc.)
  - Middle-age & older

- Unintentional (“accidental” injury)
  - Childhood & early adulthood

All are “preventable.”
Chronic Illnesses

- Chronic illnesses are “slow-acting, long-term killers that can be treated but not cured”
  - Develop slowly, hard to detect
  - Damage process slow, invisible
  - Lengthy treatment requiring continued need “to learn,” “reason,” and “solve problems”
  - No immediate consequences of back-sliding
Avoiding Chronic Illness Requires Foresight & Prevention

- Keep informed
- Live healthy lifestyle
- Get preventive checkups
- Detect signs and symptoms
- Seek timely, appropriate medical attention
Chronic Illnesses Require Self-Regulation

- Follow treatment regimen
  - Use medications as prescribed
  - Diet, exercise, no smoking, etc.
  - Including for diseases without outward signs (e.g., hypertension)
- Monitor daily signs and symptoms
- Adjust medication and behavior in response to signs
- Have regular check-ups
Accidents: Prevention Is Key

- Recognize hazards
- Prevent incidents starting
- Halt progress of incidents
- Limit damage during incidents
- Recover and redesign

- Same process as with chronic illnesses
- Myriad low-probability, often-hidden hazards
- Damage usually small, but it cumulates
Patients Are Not Just Passive “Recipients” of Care

- Chronic diseases are demanding jobs
- Patient performance matters
- Non-adherence might be better understood if the jobs better understood, from patient’s perspective
A Diabetic’s Job

- **Learn about diabetes in general** *(At “entry”)*
  - Physiological process
  - Interdependence of diet, exercise, meds
  - Symptoms & corrective action
  - Consequences of poor control
- **Apply knowledge to own case** *(Daily, Hourly)*
  - Implement appropriate regimen
  - Continuously monitor physical signs
  - Diagnose problems in timely manner
  - Adjust food, exercise, meds in timely and appropriate manner
- **Coordinate with relevant parties** *(Frequently)*
  - Negotiate changes in activities with family, friends, job
  - Enlist/capitalize on social support
  - Communicate status and needs to HCPs
- **Update knowledge & adjust regimen** *(Occasionally)*
  - When other chronic conditions or disabilities develop
  - When new treatments available
  - When life circumstances change
Good Performance

- **IT IS NOT** mechanically following a recipe
- **IT IS** keeping a complex system under control in often unpredictable circumstances
  - Coordinate a regimen having multiple interacting elements
  - Adjust parts as needed to maintain good control of system buffeted by many other factors
  - Anticipate lag time between (in)action and system response
  - Monitor advance “hidden” indicators (blood glucose) to prevent system veering badly out of control
  - Decide appropriate type and timing of corrective action if system veering off-track
  - Monitor/control other shocks to system (infection, emotional stress)
  - Coordinate regimen with other daily activities
  - Plan ahead (meals, meds, etc.)
    - For the expected
    - For the unexpected and unpredictable
  - Prioritize conflicting demands on time and behavior

Very Complex
Error Rates Among Diabetics

<table>
<thead>
<tr>
<th>Urban hospital outpatients: % diabetics <strong>not</strong> knowing that:</th>
<th>Health literacy level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Signal:</strong> Thirsty/tired/weak usually means blood sugar too high</td>
<td>V-low</td>
</tr>
<tr>
<td>Action: Exercise lowers blood sugar</td>
<td>40</td>
</tr>
<tr>
<td><strong>Signal:</strong> Suddenly sweaty/shaky/hungry usually means blood sugar too low</td>
<td>50</td>
</tr>
<tr>
<td>Action: Eat some form of sugar</td>
<td>62</td>
</tr>
</tbody>
</table>
Recall the Job Complexity Factor

**Complex jobs require workers to:**

(As per Arvey, 1986)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Correlation with overall job complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn and recall relevant information (symptoms)</td>
<td>0.75</td>
</tr>
<tr>
<td>Reason and make judgments (timely preventive care)</td>
<td>0.71</td>
</tr>
<tr>
<td>Deal with unexpected situations (meal delayed)</td>
<td>0.69</td>
</tr>
<tr>
<td>Identify problem situations quickly (hazards)</td>
<td>0.69</td>
</tr>
<tr>
<td>React swiftly when unexpected problems occur (injuries, asthma attack)</td>
<td>0.67</td>
</tr>
<tr>
<td>Apply common sense to solve problems</td>
<td>0.66</td>
</tr>
<tr>
<td>Learn new procedures quickly (treatment regimens)</td>
<td>0.66</td>
</tr>
<tr>
<td>Be alert &amp; quick to understand things (feverish child)</td>
<td>0.55</td>
</tr>
</tbody>
</table>
Even Simplest Tasks Pose Barriers for Some People

Label on a prescription vial:

**Acme Pharmacy Dept.**

**Date:** 07/05/03

**Rx# 19253**

**LINDA GOTTFREDSON**

**Take 4 capsules by mouth**

**1 hour prior to dental appt.**

**Amoxicillin 500mg capsule by Genev**

**Orig.**

**Date 7/31/02**

**Refill Y**

**Qty. 4**

**RPh SSM**
### How Difficult a Job?

<table>
<thead>
<tr>
<th>Complex</th>
<th>$r$</th>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Self-direction</td>
<td>Reason</td>
<td>Update knowledge</td>
<td>Analyze</td>
<td>Lack of structure</td>
<td>Criticality of position</td>
<td>Combine information</td>
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<td>Simple</td>
<td>.73</td>
<td>-</td>
<td>Physical exertion</td>
<td>Supervision</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teller</td>
<td>.51</td>
<td>-</td>
<td>Transcribe</td>
<td>Recognize</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Attorney</td>
<td>.88</td>
<td></td>
<td>Self-direction</td>
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**Do health care providers realize this?**
Much Needless Complexity
But Advances in Treatment Increase Complexity
Aging Reduces Ability While Greatly Increasing Complexity

"Okay your father managed to get a mouse. Now how do we use it?"
Conclusion

• Access to care is important, but not enough
• Motivation is important, but not enough
• Job descriptions for a few chronic illnesses would shock health care providers

Need a PAQ for chronic diseases
Also Need for Evolution of Intelligence Itself

• What ecological demands could have selected for a highly general, content-independent general ability?
But wasn’t life simpler in the early human EEA?

- Yes, but it was never $g$-proof
- Opportunity to learn & reason + within-group variation in $g$ = opportunity for selection
- Tiny effect size + many generations = big shift in distribution
Plan, Anticipate Problems

“Shhhh. Zog! ... Here come one now!”
High-g innovators make like difficult for everyone else
What Unique to Human EEA?

**Human Innovation**

- Changed physical environment or how humans interacted with it (e.g., fire, weapons)
- Improved average well-being but created novel risks (e.g., burns/scalds, inattention to snakes)
- Put a premium on independent learning and foresight,
  - especially for recognizing hazards and preventing “accidental” injury and death during core activities

Innovation & hazards require a mind’s eye—imagination, foresight
## Cause of Ache Deaths (N, <1971)

<table>
<thead>
<tr>
<th>Age:</th>
<th>0-3</th>
<th>4-14</th>
<th>15-59</th>
<th>60+</th>
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Most are “mistakes” (faulty mind’s eye) during provisioning

Mistakes reverberate
## Cause of Ache Deaths (N, <1971)

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</table>
Migration Ratchet

Innovate to adapt to harsher climates:
- clothing, shelter
- storage, preservation

Bigger consequences
- More hazards
- More complexity
- More innovations

Mean IQ rises

Relative risk steepens

Imaginators

Relative risk steepens

Mean IQ rises

Bigger consequences
Relative risk steepens

Mean IQ rises

Bigger consequences

Innovate to adapt to harsher climates:
- clothing, shelter
- storage, preservation

More hazards

More complexity

More innovations

“Evolution of idiots” (Scott Adams)
What Killed Differentially by $g$ Level?

• Not the obvious
  – Not high-interest, high-probability threats to band’s survival (e.g., starvation, harsh climate)
  – Because the fruits of competence are shared (e.g., meat from hunting)

• But the “minor” side-effects of core tasks
  – Myriad low-probability, chance-laden, oft-ignored risks in daily chores (e.g., “accidental” injury)
  – Costs of injury not shared widely

Recall Spearman-Brown Formula for test reliability:
Low-$g$ items can yield high-$g$ test when many items cumulated (here: across tasks, individuals, generations)
Big Picture

- Ecology makes functional demands
- Small and cumulative errors cumulate
- People differ, even when have same barriers and privileges
- Social competition is not answer to all performance questions
Thank you.