### Health Self-Care as a Complex, Lifelong Career: Implications for Patients, Providers, and Policy Makers

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Medici Conference, Center for Positive Psychology University of Pennsylvania

### Questions

- Why is health self-care a job?
- What's IQ got to do with health?
- What's physical health (or IQ) got to do with subjective well-being?
- If we can't change IQ, isn't it a dead-end a pessimistic stance—to study the impact of IQ on health?

### Individual Differences in Development



# IQ Predicts Performance in Many Life Arenas, But Not Equally Well



g = The general mental ability factor; a general facility at learning & reasoning

### IQ Predicts Performance Best in Most Complex Jobs

IQs of applicants for: Attorney, Engineer

Teacher, Programmer

Secretary, Lab tech

Meter reader, Teller

Welder, Security guard

Packer, Custodian



.2

.8

.5

### IQ/g Level Affects Trainability



# IQ Predicts Mortality: Example

• IQ at Age 18

Australian veterans followed to age 40	Death rate per 10,000	
IQ: above 115	51.3	
100-115	51.5	
85-100	92.2	<b>2</b> x
80- 85	146.7	Зх

"People with lower IQ may have a poorer ability to assess risks and, consequently, may take more risks in their driving." 1 more IQ point = 1% lower death rate

### What is Good Health?

The physiological system is:

- Under control, functioning optimally
- Resists perturbation, recovers quickly
- Crucial parts intact, functional, & without premature wear or incubating problems
- Facilitates pursuit of owner's goals

### Minding That System 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."

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

# Daily Life is Full of Hazards



# Avoiding Accidents Requires "Defensive Driving"

- 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

# 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=Adherence

- **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 and demanding!

But what <u>specifically</u> makes a job or task more cognitively complex? (i.e., tax lower-*g* individuals more heavily)

### Clues From Job Analyses: Behavioral Demands

Complex jobs require workers to: (Arvey, 1986)	Correlation with overall job
(Applied to health)	complexity
Learn and recall <u>relevant</u> information (symptoms)	.75
Reason and make judgments (timely preventive ca	re) <b>.71</b>
Deal with unexpected situations (meal delayed)	.69
Identify problem situations quickly (hazards)	.69
React swiftly when unexpected	
problems occur (injuries, asthma attack)	.67
Apply common sense to solve problems	.66
Learn new procedures <u>quickly</u> (treatment regimens	.66
Be alert & <u>quick</u> to understand things (feverish ch	ild) <b>.55</b>

# Plan, Anticipate Problems



"Shhhh, Zog! ... Here come one now!"

### More Clues: Task Demands

Cor	nplex	<u>r</u>		
	Δtto	.88 mev	Self-direction	Combine information
	Atto	.86	Reason	Advise
		.85	Update knowledge	Write
		.83	Analyze Patient?	Plan
		.79	Lack of structure	Negotiate, Persuade
		.71	Criticality of position	Coordinate
				Instruct
	Telle	<b>r</b> .51	Transcribe	
		.36	Recognize	
		49	Repetitive	
	Cus	toðfar	Physical exertion	
Sim	ple	73	Supervision	

### Common Building Blocks of Task Complexity

- 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
  - Little supervision; need for independent judgment

### Item Complexity & Error Rates in Health Literacy Surveys

- Items simulate everyday health tasks
- Analyses of what increases item difficulty (error rates)
- Increasingly difficult tasks can use the same info





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Pediatric Dosage Chart Drops, Syrup, & Chewables

Sample item from the HALS

				Dosage	
Age	Approximate Weight Range*	Drops	Syrup	Chewables 80 mg	Chewables 160 mg
† Under 3 mo	Under 13 lb	½ dropper	1/4 tsp	-	-
† 3 to 9 mo	13-20 lb	1 dropper	½ tsp	-	-
† 10 to 24 mo	21-26 lb	1½ droppers	¾ tsp		-
2 to 3 yr	27-35 lb	2 droppers	1 tsp	2 tablets	_
4 to 5 yr	36-43 lb	3 droppers	1½ tsp	3 tablets	1 <sup>½</sup> tablets
6 to 8 yr	44-62 lb	-	2 tsp	4 tablets	2 tablets
9 to 10 yr	63-79 lb	_	2½tsp	5 tablets	2 <sup>1</sup> / <sub>2</sub> tablets
11 yr	80-89 lb	-	3 tsp	6 tablets	3 tablets
12 yr and older	90 lb & over	_	3-4 tsp	6-8 tablets	3-4 tablets

t Consult with physician before administering to children under the age of 2 years. Dosage may be given every 4 hours as needed but not more than 5 times daily. How Supplied:

Drops: Each 0.8 ml dropper contains 80 mg (1.23 grains) acetaminophen.

Syrup: Each 5 ml teaspoon contains 160 mg (2.46 grains) acetaminophen

Chewables: Regular tablets contain 80 mg (1.23 grains) acetaminophen each. Double strength tablets contain 160 mg (2.46 grains) acetaminophen each.

\* If child is significantly under- or overweight, dosage may need to be adjusted accordingly.

The weight categories in this chart are designed to approximate effective dose ranges of 10-15 milligrams per kilogram. (Current Pediatric Diagnosis and Treatment. 8th ed. CH Kempe and HK Silver, ed. Lange Medical Publications: 1984, p. 1079) L4:1451-28 © 1988, Bristol-Myers U.S. Pharmaceutical and Nutritional Group. Evansville, Indiana 47721 U.S.A. © 1988, Bristol-Myers Pharmaceutical and Nutritional Group.

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# #1—Underline sentence saying how often to administer medication

**Pediatric Dosage Chart** 

Recommend ALCOHOL-FREE ASPIRIN-FREE ACETAMINOPHEN

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Pediatric Dosage Chart Drops, Syrup, & Chewables

One piece of info
Simple match
But lots of irrelevant info





Could train them do this item, but not all possible ones



### #2—How much syrup for 10-yearold who weighs 50 pounds?

**Pediatric Dosage Chart** 

??

#### Recommend



Pediatric Dosage Chart



Drops, Syrup, & Chewables

Spot & reconcile conflicting info
Inference from ambiguous info
Multiple features to match

Age	Approximate Weight Range*	Drops	S	yrup	Chewables 80 mg	Chewables 160 mg
† Under 3 mo	Under 13 lb	½ dropper	7	tsp	-	-
† 3 to 9 mo	13-20 lb	1 dropper	7	tsp	—	-
† 10 to 24 mo	21-26 lb	1½ droppers	3/	tsp	_	-
2 to 3 yr	27-35 lb	2 droppers	1	tsp	2 tablets	<u> </u>
4 to 5 yr	26 42 lb	3 droppers	1	tsp 1	3 tablets	1 <sup>1</sup> / <sub>2</sub> tablets
6 to 8 vr	44-62 lb		2	tsp	4 tablets	2 tablets
9 to 10 yr	63-79 lb		2	%tsp	5 tablets	2 <sup>1</sup> / <sub>2</sub> tablets
тт уг	80-89 lb	-	З	tsp	6 tablets	3 tablets
12 yr and older	90 lb & over	_	3-	4 tsp	6-8 tablets	3-4 tablets

strength tablets contain 160 mg (2.46 grains) acetaminophen each

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Pediatric Dosage Chart

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Drops, Syrup, & Chewables

•Spot & reconcile conflicting info Inference from ambiguous info •Multiple features to match

			Dosage			
Age	Approximate Weight Range*	Drops	Syrup	Chewables 80 mg	Chewables 160 mg	
† Under 3 mo	Under 13 lb	½ dropper	¼ tsp	-	-	
† 3 to 9 mo	13-20 lb	1 dropper	½ tsp	_	-	
† 10 to 24 mo	21-26 lb	1½ droppers	<sup>3</sup> ⁄ <sub>4</sub> tsp	8 <u>—</u> 8	-	
2 to 3 yr	27-35 lb	2 droppers	1 tsp	2 tablets	_	
4 to 5 yr	36-43 lb	3 droppers	1½ tsp	3 tablets	1 <sup>½</sup> tablets	
6 to 8 yr	44-62 lb		2 tsp	4 tablets	2 tablets	
9 to 10 yr	63-79 lb	-	2½tsp	5 tablets	2 <sup>1</sup> / <sub>2</sub> tablets	
11 yr	80-89 lb	_	3 tsp	6 tablets	3 tablets	
12 yr and older	90 lb & over		3-4 tsp	6-8 tablets	3-4 tablets	

% US adults routinely functioning below this level? 46%

Dosage may be given every 4 hours as needed but not more than 5 times daily.



### #3—Your child is 11 years old and weighs 85 pounds. How many 80 mg tablets can you give in 24-hr period?



•Two-step task

- Infer proper math operation
- Select proper numbers to use
- •Ignore the most obvious but incorrect number Calculate the result





Pediatric Dosage Chart Drops, Syrup, & Chewables

Age	Approximate Weight Range*	Drops	Syrup	Chewables 80 mg	Chewables 160 mg
† Under 3 mo	Under 13 lb	½ dropper	¼ tsp	-	_
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- •Multiple features to match
- •Two-step task
- Infer proper math operation
- •Select proper numbers to use
- Ignore the most obvious but incorrect number
  Calculate the result

Pediatric Dosage Chart D

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				Dosage	
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2 to 3 yr	27-35 lb	2 droppers	1 tsp	2 tablets	<u></u>
4 to 5 yr	36-43 lb	3 droppers	1½ tsp	3 tablets	1 <sup>½</sup> tablets
6 to 8 yr	44-62 lb	_	2 tsp	4 tablets	2 tablets
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11 yr	80-89 lb	-	3 tsp	6 tablets	3 tablets
12 yr and older	90 lb & over	_	3-4 tsp	6-8 tablets	3-4 tablets

% US adults routinely functioning <u>below</u> this level? **99%** 

Dosage may be given every 4 hours as needed but not more than 5 times dally. How Supplied:

Drops: Each 0.8 ml dropper contains 80 mg (1.23 grains) acetaminophen.



### Patient Performance on Other Health Literacy (TOHFLA) Items

Patients examine the actual vials or documents

% of urban h	Health literacy level			
	Many professionals have no idea how difficult these "simple" things are for others	V-low	Low	OK
How to take m	24	9	5	
When next app	40	13	5	
How many pills	70	34	13	
What an inform saying	ned consent form is	95	72	22

### **Error Rates Among Diabetics**

Urban hospital outpatients:	Health literacy level			
% diabetics <i>not</i> knowing that:	V-low	Low	OK	
Signal: Thirsty/tired/weak usually means blood sugar too high	• 40	31	25	
Action: Exercise lowers blood sugar	60	54	35	
<b>Signal:</b> Suddenly sweaty/shaky/hungry usually means blood sugar too low	50	15	6	
Action: Eat some form of sugar	62	46	27	

### **Cognitive Barriers Rise**

• As treatments become more complex

• As individuals age (more illness, less cognitive ability)



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

### Some Complexity Is Needless!



Confusing forms, handouts, labels; clinic layout, provider's vocabulary, etc.

### Example

Back of a box of cold medicine

INDICATIONS: These Maximum Strength Tablets contain four effective ingredients for the temp rary relief of these major cold and flu symptoms: A Nasal Decongestant - to relieve stuffy nose and sinus congestion. An Antihistamine - to dry up runny nose and relieve sneezing. A Cough Suppressant - to quiet cough. A Mon-aspirin Analgesic - to relieve headache, fever, minor some throat pain and body aches and pain.

DIRECTIONS: Adults: 2 tablets every 6 hours while symptoms persist, not to exceed 8 tablets in 24 hours, or as directed by a doctor. Children under 12: Consult a doctor.

WABNINGS: KEEP THIS AND ALL OTHER MEDICATIONS OUT OF THE REACH OF CHILDREN. IN CASE OF ACCIDENTAL OVERDOSE, SEEK PROFESSIONAL ASSISTANCE OR CONTACT A POISON CONTROL CENTER IMMEDIATELY. PROMPT MEDICAL ADULTS AS WELL AS FOR NOT NOTICE ANY SIGNS OR AT CH St Cluttered , if you are pregnant or nursing health professional before using a b this product. Do not give this product to children under 12 years of a ever for more than 3 d <sup>3 d</sup> **Poor chunking** ms do not improve that lasts for more that a days, in new symptoms accur, of in redness or swelling is present, consult a doctor. Do not exceed recommended dos ss occur, **Key points buried** dis

ough may more than

7 days, cenus to recur or is accompanied by rash, persistent hea

#### per Hard words astl .....

be

than 3 days, or if new not take this product for s occurs with smoking,

throat is severe, persists for more than 2 days, is accompanied or followed by a fever, headache, rash, nausea or vomiting, consult a doctor promptly. Do not take this product, unless directed by a doctor, if you have a breathing problem such as

emphysema or chronic bronchitis, or if you have heart disease. high blood pressure, thyroid disease, diabetes, glaucoma or difficulty in urination du d. May cause parked dro quilizers may increase Only 61% of adults ic

beverages while taking

you are taking sedatives or tranquilizers without first consulting your doctor. Use caution when driving a motor vehicle or operating

machinery. May cause excitability, especially in children.

ALCOHOL WARNING: If you generally consume 3 or more alcohol-containing drinks per day, you should consult your physician for advice on when and how you should take this product and other pain relievers.

**DRUG INTERACTION PRECAUTION:** Do not use this product if you are now taking a prescription monoamine oxidase inhibitor (MAOI) (certain drugs for depression, psychiatric or emotional conditions, or Parkinson's disease), or for two weeks after stopping the MAOI drug. If you are uncertain whether your prescription drug contains an MAOI, consult a health professional before taking this product.

ACTIVE INGREDIENTS (PER TABLET): Acetaminophen 500mg; Dextromethorphan HBr 15mg; Chlorpheniramine Maleate 2mg; Pseudoephedrine HCI 30mg.

OTHER INGREDIENTS: Carnauba Wax, Croscarmellose Sodium, D&C Yellow No. 10 Aluminum Lake, FD&C Red No. 40 Aluminum Lake, Hydroxypropyl Methylcellulose, Magnesium Stearate, Microcrystalline Cellulose, Polydextrose, Polyethylene Glycol, Povidone, Sodium Starch Glycolate, Starch, Stearic Acid, Titanium Dioxide, Triacetic.

#### STORE AT ROOM TEMPERATURE.

\*This product is not manufactured or distributed by Bristol-Myers Products, distributor of Comtrex®.

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### Ways to Simplify

### Such as simpler words

Drug Facts         Active ingredients (in each softgel)       Purpose         Guaitenesin, USP 200 mg       Expectorant         Pseudoepnodrine HCI, USP 30 mg       Nasal decongestant         Uses       Image: Common cold in the properties of the properti	<ul> <li>Drug Facts (continued)</li> <li>Stop use and ask a doctor if</li> <li>you get nervous, dizzy, or sleepless</li> <li>symptoms do not get better within 7 days or are accompanied by fever</li> <li>cough lasts more than 7 days, comes back, or is accompanied by fever, rash, or persistent headache. These could be signs of a serious condition.</li> </ul>
<ul> <li>helps loosen phlegm (mucus) and thin bronchial secretions to make coughs more productive</li> </ul>	Keep out of reach of children. In case of overdose, get medical help or contact a Poison Control Center right away.
Warnings Do not use if you are now taking a prescription monoamine oxidase inhibitor (MAOI) (certain drugs for depression, psychiatric, or emotional conditions, or Parkinson's disease), or for 2 weeks after	Directions <ul> <li>do not use more than 4 doses in any 24-hour period</li> </ul> Age   Dose
stopping the MAOI drug. If you do not know if your prescription drug contains an MAOI, ask a doctor or pharmacist before taking this product.	adults and children 12 years and over 2 softgels every 4 hours children 6 to under 12 years 1 softgel every 4 hours children under 6 years ask a doctor
Ask a doctor before use if you have heart disease high blood pressure thyroid disease diabetes	Other information ■ store at 20-25°C (68-77°F)
<ul> <li>trouble urinating due to an enlarged prostate gland</li> <li>cough that occurs with too much phlegm (mucus)</li> <li>cough that lasts or is chronic such as occurs with smoking, asthma, chronic bronchitis, or emphysema</li> </ul>	<b>Inactive ingredients</b> FD&C green no. 3, gelatin, glycerin, mannitol, pharmaceutical glaze, polyethylene glycol, povidone, propylene glycol, sorbitan, sorbitol, titanium dioxide, water
When using this product do not use more than directed	

### But Much Complexity Is Inherent: Examples from Diabetes

### • Known cognitive hurdles

- Abstract concepts in meal planning: carbohydrates ("includes sugar, but not pasta")
- Immediate costs and benefits are favored over future benefits and costs (cheating on one's diet, failure to monitor blood glucose)

### • Underappreciated

- Assuming that non-adherence which causes no obvious immediate harm isn't dangerous (DKA from failing to take insulin for several days)
- False security from not grasping abstract concepts of risk, probability, & cumulative damage ("Not planning ahead/not testing myself hasn't gotten me in trouble, so there is no need for it.")
- Not knowing when a deviation is big enough or frequent enough to cause concern (elevated glucose readings)
- Cognitive overload ("It's too complicated—too much to bother with.")
- Distrust created when patients don't understand the limits of medical understanding and advice ("I'm not going to listen to her anymore because the medicine she gave me didn't work." Or, "He said he didn't know if it would work.")
- NOTE: These are not arbitrary "beliefs" that can just be replaced; they are failures to comprehend (cognitive errors)

### More Examples of Cognitive Hurdles

- Hypertension
  - No outward symptoms
  - So treatment is a nuisance without obvious benefits
- Asthma
  - Symptoms are obvious, but benefits of the superior drug are not
    - Brochodilators give immediate but only temporary relief
    - Inhaled steroids don't give fast relief but provide better longterm control

### 3 Ways to Minimize Cognitive Barriers

- 1. Mobilize person's abilities
- 2. Provide cognitive assistance
- 3. Reduce task complexity



# **Old Lessons in New Settings**

- Small effects matter; over time, they add up doing "the small things" right, day after day, minimizes unnecessary illness and injury
- 2. Individuals have more influence over their development than they realize or exercise

their health depends more on their own behavior than their doctors'; patients need not and should not be passive consumers of care

3. Different genotypes do not experience or utilize the "same" environments in the same way, nor benefit equally from them patients differ in their ability to understand and adhere to the same treatments. One-size-fits-all information and treatment does not work.

### 4. Conversely, different genotypes require different environments to thrive

patients who learn slowly and reason poorly will not understand regimens and communications geared to the average patient (or physician!)

5. Environments—jobs—are malleable

cognitive barriers can sometimes be lowered by simplifying/reconfiguring regimens

### Thank you.