

Positive Neuropsychology: Promoting Cognitive Health Across the Lifespan

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Summary

- Cognitive Health/Positive Psychology
- NP Journal Reviews
- Positive Neuropsychology Definition and Scope
- C.A.P.E. Model of Cognitive Health
- Exceptional Cognition
- Positive Outcomes
- Promoting Cognitive Health in Clinical Practice

What is Cognitive Health?

- Commonly discussed aspects of health:
 - Physical/Cardiovascular
 - Mental/Emotional/Behavioral
- **Cognitive health:** using one's cognitive abilities effectively in daily life to maintain or improve functioning

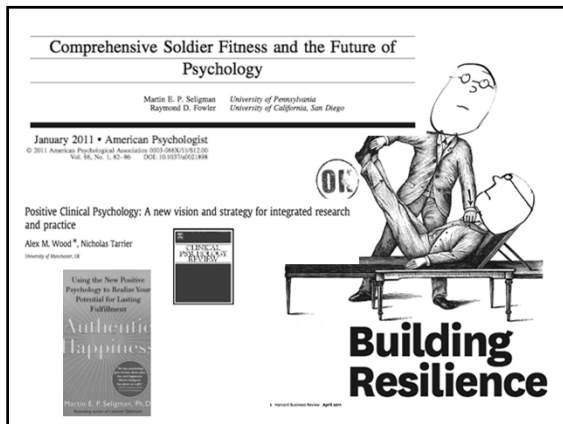
Positive Psychology

- Study and promotion of positive emotion, character strengths, happiness, resilience, and optimism
- Dr. Martin Seligman's 1998 APA Address was original call to action re: Positive Psych
- Significant growth last 10-15 years

Positive Psychology

"We have argued that psychology as a field has been preoccupied with the negative side of life and has left us with a view of human qualities that is warped and one-sided...a balance is needed between work that strives to relieve damage, and work that endeavors to build strength."

Gillham & Seligman, 1999



Neuropsychology defined

- AACN practice guidelines (2007): “an applied science that examines the impact of both normal and abnormal brain functioning on a broad range of cognitive, emotional, and behavioral functions”

Does Neuropsychology Address Cognitive Health?

- How often do published neuropsychological studies aim to study or promote cognitive health?
- Has positive psychology’s emphasis on growth and positive attributes influenced neuropsychology over time?

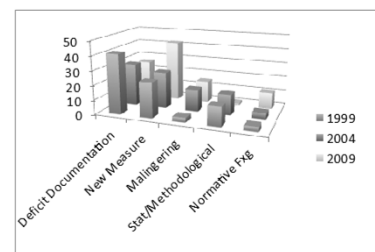
Neuropsychological Journal Reviews

- Conducted reviews of three prominent NP journals over 10-year period (*JINS*, *Neuropsychology*, *ACN*)
- Examined primary study aims based on manuscript titles and abstracts (excluded case studies/reviews)
- Categorized studies based on study aims

ACN Literature Review

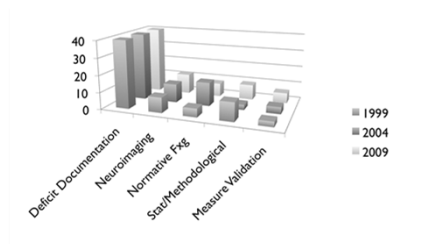
- Examined 10-year publication trends in *Archives of Clinical Neuropsychology*
- Titles and abstracts from all empirical papers published in *ACN* in 1999, 2004, and 2009 (N = 145) were reviewed and classified into categories based on primary study aims

ACN Review: % of Papers in Different Categories



Randolph, 2010

JINS Review: % of Papers in Different Categories



Randolph, 2013

ACN 2014 Review: % of Papers By Category

- 31%: Characterizing cognitive deficits
- 28%: Validating neuropsychological measures
- 17%: Examining performance validity measures and procedures
- 9%: *Evaluating effects of lifestyle factors on cognition*
- 6%: Normative cognitive functioning
- 3%: Statistics/Methodology

Randolph, 2015

JINS 2014 Review: % of Papers By Category

- 47%: Deficit documentation
- 18%: Measure validation
- 11%: Neuroimaging
- 10%: *Lifestyle factors and cognition/cognitive rehab*
- 5% Normative functioning

Randolph, 2015

Positive Neuropsychology

- Overarching orientation focused on the study and promotion of cognitive health
- Beyond "assessment vs. rehab" dichotomy...

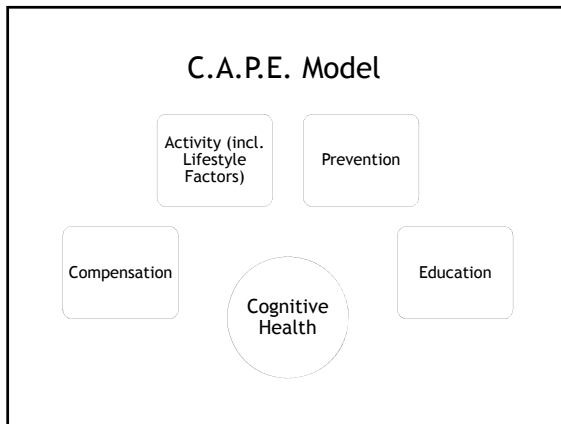
Domains of Positive Neuropsychology

- Compensation and coping strategies to promote cognitive health
- Role of positive lifestyle factors/activities on cognition
- Prevention efforts to maintain optimal cognition
- Public education and advocacy
- Studying normal and robust cognitive functioning
- Understanding positive cognitive outcomes

Is PNP a New Idea?

- Dr. Ron Ruff's 2001 NAN Presidential Address:

"Patients' needs are not being met by merely diagnosing cognitive deficits...there is a growing need to advance services that maintain cognitive health...the time has come for neuropsychologists to identify as caretakers for cognitive health."



CAPE Model: Compensation

- 1) **External compensatory strategies**
→ Cognitive strategies based on the environment or a physical aid
- 2) **Internal compensatory strategies**
→ Cognitive strategies that are self-generated
- 3) **Emotional compensation**

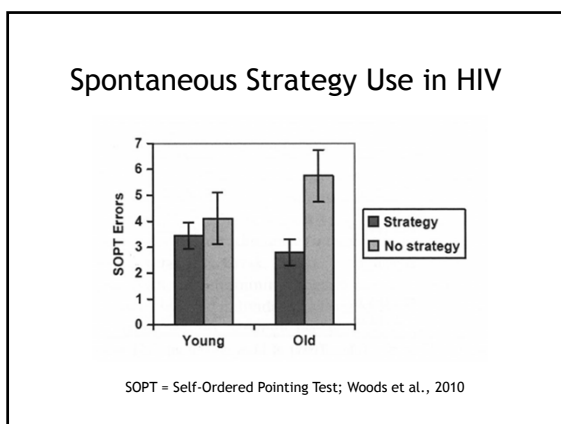
External and Internal Executive Strategies to Consider Reviewing During Evaluation Feedback Sessions

Compensatory Strategy	Type
Consistently use an appointment book, memory notebook, or smartphone	External
Use prioritized and targeted lists (4-5 items) with task time estimates	External
Use a specific notepad to write down extraneous thoughts during task completion to act on later	External
Place common items (e.g., keys, purse) in consistent locations	External
Create a bill payment system (including auto-pay)	External

Randolph & Chaytor, 2013

Compensatory Strategy	Type
Break tasks into manageable and time-limited components	Internal
Verbalize or "talk oneself through" each step of the task	Internal
Complete tasks one step at a time	Internal
Avoid attempting multiple tasks at once	Internal
Process new information actively rather than passively (e.g., use repetition and paraphrasing in conversation)	Internal
Cluster new information into easily retrieved categories or frameworks (e.g., acronyms, rhymes)	Internal

Randolph & Chaytor, 2013



A Simple Strategy in Schizophrenia

- Perry et al. (2001):
 - Schizophrenia patients asked to complete WCST under 2 conditions:
 - Standard instructions
 - Modified instructions: asked to state reason why matched card
 - More categories, fewer perseverative responses with modified instructions

Technology Use for IADLs



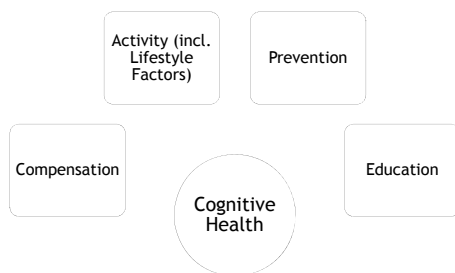
Schmitter-Edgecombe et al., 2013



Emotional Coping and Cognition

- Active coping protects individuals with MS from developing depression related to cognitive dysfunction (Rabinowitz & Arnett, 2009)
- Perceived emotional support associated with better mental flexibility and processing speed (Zahodne et al., 2014)

C.A.P.E. Model



CAPE Model: Activity/Lifestyle Factors

- Aerobic activity and physical fitness
- Social activity
- Intellectual activity

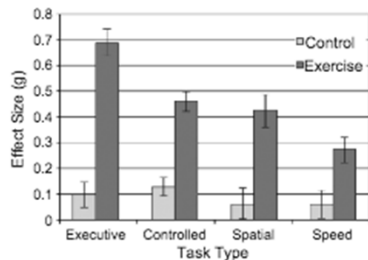
How Much Exercise Matters?

- CDC recommendation:
 - Kids: Moderate activity 60 min/day; strength training 3 days/week
 - Adults/Older Adults: Moderate activity 150 min/week; strength training 2 days/week
- Even ~20 minutes/day shown to have positive effects on cognition and brain structure
- No age limits to benefits of exercise on the brain (young kids to "old-old" adults)

Brain-based Benefits of Exercise

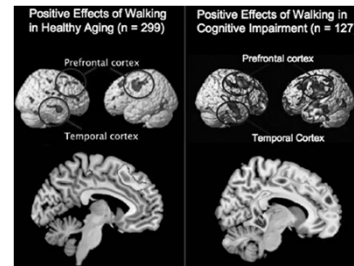
- Neurogenesis (e.g., in hippocampus, frontal lobes)
- Improves functioning of existing neurons (e.g., plasticity)
- Increases NTs/neurotrophins (e.g., BDNF)
- Improves vascular health, growth, maintenance
- Reduces oxidative stress on brain
- Reduces brain inflammation
- May counteract genetic risk factors/interact with genes
- Improves multiple cognitive abilities (esp. executive functions)

Physical Activity and EFs in Aging



Colcombe & Kramer, 2003; in Hertzog et al., 2009

Effects of Walking on the Brain



Erickson et al., 2010; Raji et al., 2010

Other Populations Showing Cognitive Benefits from Exercise

- ADHD (Randolph, 2016)
- CVA (Moriya et al., 2016)
- Breast cancer survivors (Cooke et al., 2016)
- TBI (Chin et al., 2015)
- MS (Sandroff et al., 2016)
- Major depression (Greer et al., 2015)

Social Activity and Cognitive Health



Social Activity and Cognitive Health

- More socially active adults experience less cognitive decline
- Social activity promotes cognition (memory, speed, spatial skills in particular) above and beyond other activities
- Strong social/leisure activity may compensate for low activity in another activity area
- Multiple social activities ideal

Social Networks and the Brain

- Does social network size impact the brain?
 - Study with 89 older adults, mean age 81 (beginning of study)
 - Assessed cognition/social networks; brain pathology on autopsy
 - Main finding: social network size moderated relationship between brain pathology (esp. neurofibrillary tangles) and cognition

The bigger the network, the less impact pathology had on cognition

- Same results after accounting for depression, physical/mental activity, chronic diseases

Bennett et al., 2006

Intellectual Activity and Cognition: Religious Orders Study

- 801 nuns, priests, brothers age 65+ studied over ~4.5 years
- Those with most intellectual activity were 47% less likely to develop Alzheimer's disease than least active
- Activities reported:
 - Reading newspaper
 - Visiting museums
 - Doing puzzles
 - Playing cards

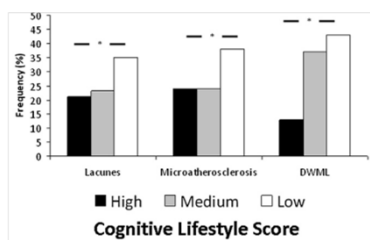
Wilson et al., 2002

Crossword Puzzles and Dementia

- Studied 101 older adults age 75-85 (total N = 488)
- Cognitively intact at baseline but later developed dementia
- Crossword puzzlers showed delay in memory decline onset by 2.5 years
- Other mental activities not related to cognitive changes beyond puzzle effect

Pillai et al., 2011

Lifestyle Activities and Microvascular Disease

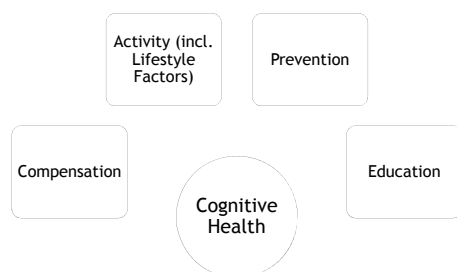


Valenzuela et al., 2012

Mediational Variables in Cognitive Health Research

- Not always a 1:1 relationship between activity + cognition
- Exercise-cognition impact stronger in APOE ε4 carriers, older adults (Smith et al., 2014; Colcombe & Kramer, 2003)
- Personality traits associated with cognitive stability vs. decline (using NEO-PI-R; Caselli et al., 2016):
 - Less memory decline in APOE ε4 carriers with higher Conscientiousness
 - Less visuospatial decline in APOE ε4 carriers with higher Openness (to experience)

C.A.P.E. Model



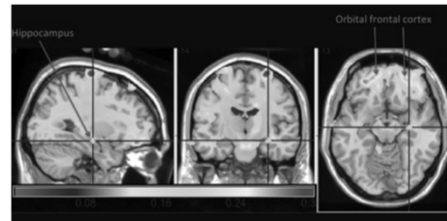
CAPE Model: Prevention

- Improving diet + reducing dietary/cardiovascular risk factors
- Treating secondary factors, e.g., sleep disturbance, depression, stress, pain, fatigue
- Proactive training in use of (effective) compensatory strategies
- Sports concussion management/reduction programs at all levels/ages

Nutrition and Cognition

- “What’s good for the heart is good for the brain”
- Omega-3: possibly some benefit; moderates effects of physical activity on cognition (Leckie et al., 2014)
- Mediterranean diet:
 - High fruit/vegetable/whole grains/legumes
 - Moderate fish, olive oil; low red wine, red meat, dairy
 - Combines omega-3, vitamin D, antioxidants
 - Reduced risk of cognitive decline + dementia

Fish Consumption and Gray Matter Volume



Raji et al., 2014

Compensatory Sleep Strategies

- Single night of “recovery sleep” after sleep restriction improves sustained attention + working memory
- Napping:
 - 5-15 minute naps boost cognition up to 3 hours
 - Longer naps may have more lasting cognitive benefits
 - 1-4pm = ideal nap window
 - More cognitive gains if not generally sleep deprived (Lovato & Lack, 2010)

Minimizing Ineffective Strategies

- Ophir et al. (2009) compared heavy vs. light media multitaskers (college students)
 - Heavy multitaskers:
 - More susceptible to irrelevant environmental stimuli
 - Worse performance on a task-switching measure

Sports Concussion Prevention/Management

- Awareness of safer playing techniques
- “Fair Play” rules in hockey
- Print/media educational materials (e.g., NFL/NHL DVDs)
- Legislation

Echemendia, 2013

CAPE Model: Education

- Teaching the public who we are and what we do
- Describing how we differ from other health and mental health professionals
- Clarifying our roles in university settings, medical centers, private practice, business, etc.

CAPE Model: Education

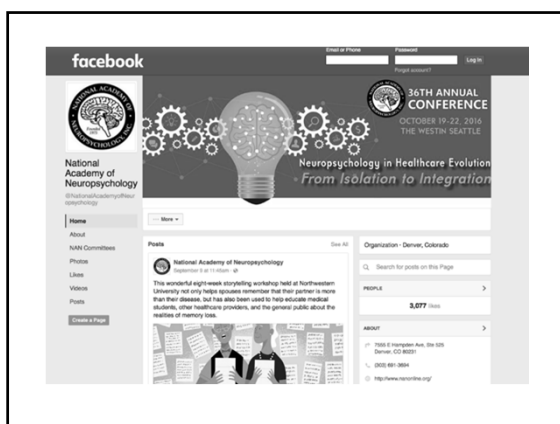
- Correcting misperceptions re: cognitive functioning
- Public generally shows poor “cognitive health literacy”
 - Similar to misperceptions regarding mental health and psychological disorders (see Jorm 2012)

Does the Public Understand what Impacts Cognitive Health?

- Recent survey of CH beliefs (N = 900; Hosking et al., 2015)
 - Factors considered to have adverse effects on cognitive health:
 - Alcohol abuse (reported by 34% of sample)
 - Lack of mental stimulation (reported by 22%)
 - Smoking (reported by 19%)
 - Poor nutrition (reported by 18%)
 - Lack of physical activity (reported by 16%)
 - Fewer than 5% spontaneously identified TBI, HTN, mental health, genetics, aging, or environmental toxins

Public Understanding of Neurological Conditions

- Guilmette & Paglia (2004): follow up of prior surveys by Gouvier et al. and Willer et al. (1988/1993)
 - No significant change in public knowledge re: TBI
 - 42% believed a 2nd blow to head improves memory
 - 60% believed most people with severe TBIs will return to previous jobs
 - Comparable findings in RI, NY, Ontario, LA
- Widespread misconceptions re: concussion, epilepsy, dementia



Exceptional Cognition

Exceptional Cognition

- More empirical focus on cognitive impairment than cognitive strength
- Understanding exceptional cognition may have implications for cognitive health and rehabilitation

The (Limited) Life of Pi

- Chao Lu—memorized 67,890 digits of pi (world record)
- Associated numbers with images and created related stories and substories
- Years later, could only spontaneously recall 39 digits

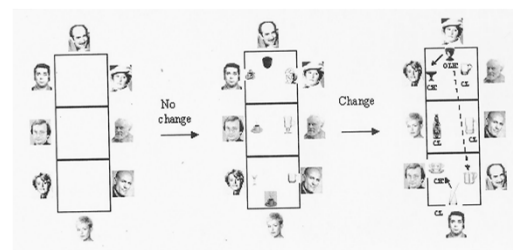
Hu & Ericsson, 2012

Study of Superior Cognitive Fxg

- Naturalistic memory strategies in Buenos Aires waiters: “Tortoni effect”
- Studied ability to remember drink orders in 9 waiters with 9-17 years experience
- 8 “customers”
- Assessed ability to deliver correct order to correct customer in original or changed locations

Bekinschtein et al., 2008

Tortoni Effect



Bekinschtein et al., 2008

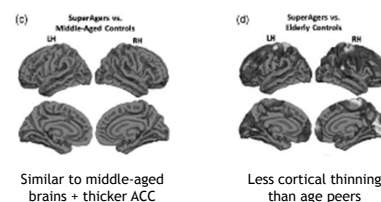
Tortoni Effect

- In original location, only 1 waiter made error
- In changed location, only 1 waiter did not make error
- For volunteer waiters, most made 3+ mistakes in original location, but similar to experts re: changed location performance
- Spatial/feature-based strategy = primary method used by expert waiters (developed spontaneously)

Bekinschtein et al., 2008

“Super Agers”

- Older adults (age 80+) with superior memory performance for age; similar to 50-65 year olds



Harrison et al., 2012

Positive Cognitive Outcomes

Positive Outcomes

- What's different about individuals with cognitive dysfunction (e.g., with MCI) who remain stable?

More generally...

- What's different about patients with neurologic disease without cognitive burden?
- Lessons to be learned from marital satisfaction/National Weight Management Registry literatures?

Positive Outcomes

- TBI—correlates of positive outcomes:
 - positive attitude, determination (Todis & Glang, 2008)
 - hope, dispositional optimism (Peleg et al., 2009)
- Modifiable factors in mTBI/PCS (Belanger et al., 2013):
 - Positive coping variables (knowledge, sx attributions, self-efficacy) accounted for 21% of PCS symptom severity (beyond psychiatric/demographic factors)
 - Attributions had most robust relationship to PCS symptoms

Sense of Purpose in Life

- Greater purpose in life associated with:
 - Decreased chance of macroscopic lacunar infarcts (Yu et al., 2015)
 - Diminished risk of MCI and AD (Boyle et al., 2010)
 - Reduced impact of AD pathology on cognition (Boyle et al., 2012)

Promoting Cognitive Health in Clinical Practice

Promoting Cognitive Health in Practice

- Discuss activity levels with patients:
 - Physical activity/consider CDC recommendations for exercise
 - Social activity—volunteerism? Participate in the schools? Book groups? Exercise with a friend?
 - Cognitive/intellectual activity—explore intellectually engaging activities of interest

Consider ambivalence/barriers to engaging in these activities through motivational interviewing or other techniques

Promoting Cognitive Health in Practice

- Assess, discuss, and exploit cognitive strengths
 - Notable strengths in record review?
 - Strengths per patient/informant reports?
 - Robust or relative strengths on testing?
- Discuss possible cognitive (e.g., EF) strategies, select appealing ones, and reinforce these over time when feasible
- Consider possible role of medical conditions (esp. poorly controlled ones), insomnia, smoking on cognition + related interventions

Promoting Cognitive Health in Practice

- Consider extended or multiple feedback sessions
 - Brief strategy training associated with lasting cognitive gains (Goverover et al., 2008; Levine et al., 2000)
- Assess relative importance of cognitive vs. other concerns (e.g., depression, fatigue, chronic pain)
- Personally model cognitive and physical health (consider "The Patient Promise" at thepatientpromise.org)

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