Positive Neuropsychology: Promoting Cognitive Health Across the Lifespan

John J. Randolph, Ph.D., ABPP-CN
Geisel School of Medicine at Dartmouth
Randolph Neuropsychology Associates, PLLC

Summary

- Cognitive Health/Positive Psychology
- NP Journal Reviews
- Positive Neuropsychology Definition and Scope
- C.A.R.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
JINS Review: % of Papers in Different Categories

 Randoph, 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.”

Randolph, 2015
**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**

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**Spontaneous Strategy Use in HIV**

- 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

Cognitive Health

Compensation

Prevention

Activity (incl. Lifestyle Factors)

Education

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 NTFs/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

![Graph showing effect size (C) for Executive, Controlled, Spatial, Task Type, and Speed with bars for Control and Exercise conditions.](Colcombe & Kramer, 2003; in Hertzog et al., 2009)

Effects of Walking on the Brain

![Brain images showing positive 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

- 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

Pilai 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**

- 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

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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

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 23%)
  - 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

  - 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

- 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

Similar to middle-aged brains + thicker ACC
Less cortical thinning than age peers

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 & Giang, 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 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


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