

Hostility And Subsequent Cognitive Trajectories: 28-year Follow-up Of The Whitehall II Prospective Cohort Study

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Hostility in mid-life is associated with poorer subsequent cognitive performance, highlighting the role of personality traits in cognitive ageing.

INTRODUCTION

COGNITION

Cognition refers to essential mental capacities that support everyday functioning and clinical evaluation.

CLINICAL RELEVANCE

Cognitive fluctuation, deficits and decline are key features in many neurological disorders.

EARLY INDICATOR

Cognitive impairment is a milestone at the prodromal stage of dementia and a key modifiable factor for intervention.

RESEARCH VALUE

Monitoring cognition helps predict, detect and differentiate clinical stages and guide timely interventions.

MULTIPLE DOMAINS OF COGNITION

Verbal Written Aural Numeric Global function

Integration of cognitive measurements across different dimensions is essential to assess global cognitive function.

PERSONALITY

Personality reflects enduring patterns of thinking, feeling and behavior that are relatively stable across the lifespan.

MAJOR FRAMEWORKS

- Five-Factor Model (Big Five): Neuroticism, Extraversion, Agreeableness, Conscientiousness, Openness
- Minnesota Multiphasic Personality Inventory (MMPI): Includes independent traits such as hostility
- HEXACO Model: Honesty, Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, Openness
- Other frameworks: Hedonic Adaptation Prevention and others

KEY FEATURES OF PERSONALITY TRAITS

- Relatively stable
- Changeable with life events
- Individual differences
- Heritable biomarkers

HOSTILITY, a personality trait characterized by cynicism and interpersonal mistrust, is associated with adverse health and psychosocial outcomes, but evidence for its association with cognitive ageing is limited and inconsistent.

METHODS

DATA SOURCE

Whitehall II, a longitudinal study of British civil servants aged 35–55 years at baseline (1985–1988).

Baseline: 1985–1988 Up to 28 years of follow-up Phase 12: 2015–2016

ANALYTICAL SAMPLE

Our analytical sample included participants who completed the hostility assessment in Phase 1, with information on cognitive functioning at Phase 5 and complete information on covariates at baseline.

75% of the 10,308 participants were asked to complete the hostility scale due to this measure being introduced after the start of the baseline survey. (6,484 participants responded; 84% of those asked) (Nabi et al., 2009).

1 HOW HOSTILITY WAS MEASURED

Hostility was measured at Phase 1 using the Cook-Medley Hostility Scale – a subscale developed from the Minnesota Multiphasic Personality Inventory (MMPI) (Cook & Medley, 1954) – which included 50 items answered using true-false options.

2 SCORING & ANALYTICAL APPROACH

Total hostility scores were generated by summing scores for each item to create an overall hostility score ranging from 0 to 38, with higher scores indicating greater hostility.

Hostility score categorised into quartiles: 0–6 (Lowest), 7–10 (Second), 11–15 (Third), >16 (Highest).

1. COGNITION AT PHASE 5 (1997–1999)

We used **linear regression models** to examine associations between **hostility (continuous and quartiles)** and global cognitive scores at Phase 5 (1997–1999).

2. COGNITIVE TRAJECTORIES (1997–1999 TO 2015–2016)

We used **linear mixed models with random intercepts and slopes** to assess associations between hostility and cognitive trajectories between Phases 5 (1997–1999) and 12 (2015–2016).

3. VERBAL FLUENCY

Letter “S” fluency task

Participants were asked to write down as many words as they could think of that begin with the letter “S”, within a fixed time limit.

4. VERBAL MEMORY

Word recall task

Participants were shown 20 words – a mix of single- and double-syllable words – presented one at a time with a 2-second gap between each.

5. REASONING

Alice Heim 4-I test

Verbal and mathematical reasoning were assessed using the Alice Heim 4-I (AH4-I) test, a timed test of general intellectual ability spanning verbal and numerical problem types. Contributes a reasoning component distinct from memory and fluency, broadening what the global score captures.

6. SCORE DERIVATION

Standardisation & global score

To make the four tests comparable with each other and stable over repeated waves, raw scores were converted to a common scale before being combined.

7. CONSISTENCY ACROSS SEX

WOMEN

Same pattern of attenuation observed after covariate adjustment.

MEN

Same pattern of attenuation observed after covariate adjustment.

RESULTS

Participants: 3,219 Baseline age: 44.5 ± 5.9 yrs Women: 25.4%

Comparison	β	95% CI	CI excludes 0	Significant
Per-unit hostility	-0.01	-0.01 to -0.003	Yes	Yes
Highest vs lowest quartile	-0.11	-0.18 to -0.02	Yes	Yes

Model 1

Association with decline present

Adjusted for socio-demographic factors

Health-related: Longstanding illness, Physical activity, Adverse life events, Psychological distress

Psychosocial: Smoking, Alcohol

Consistency across sex: WOMEN, MEN

CONCLUSIONS

Hostility was associated with faster cognitive decline after socio-demographic adjustment, but this attenuated once health-related and psychosocial covariates were added

PRINCIPAL FINDINGS

- Baseline association**
Higher hostility levels were associated with worse global cognitive function at baseline.
- Association remained after adjustment**
The association persisted after adjusting for a wide range of confounders.
- Stronger evidence in women**
Subgroup analysis showed a stronger association in female participants, particularly in the highest quartile vs lowest quartile.
- Consistent with previous research**
Our findings align with prior studies showing negative correlates between hostility and cognitive function across different settings and measures.

STRENGTHS

- First study to primarily examine the direct cognition correlates of hostility in a large sample.
- Longitudinal design with decades of follow-up.
- Complete Cook-Medley Hostility Scale implemented, providing comprehensive measurement.
- Multiple domains of cognition assessed with well-established batteries, including Alice-Heim 4 (numeric and verbal reasoning).
- Adjustment for a wide range of confounders, including profession and drinking, in addition to traditional factors.
- Provides novel insights in an underexplored population: middle-aged (35–55 years) adults.

STUDY SNAPSHOT

- Large UK cohort of Civil Servants
- Decades of follow-up
- Age at baseline 35–55 years
- Extensive cognitive assessment

MAIN TAKE-HOME MESSAGE

Participants in the highest hostility quartile had poorer global cognitive outcomes than those in the lowest quartile, even after full adjustment, especially among women.

Possible Mechanisms

Hostility → mechanism unclear → Cognitive function

Candidate explanatory models:

- Biopsychosocial model: Multiple pathways combine
- Psychosocial vulnerability: Via stress and depression
- Spectrum model: Early sign of decline
- Predisposition model: Inflammation-driven pathway
- Patho-plastic model: Alters cognitive resilience
- Cause model: Shared disease drives both

Legend: Evidence still emerging (orange), Considered less likely (pink)