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WALKING SPEED AND COGNITION IN LATER LIFE: FINDINGS FROM OLDER PARTICIPANTS OF THE NIJMEGEN 4 DAYS MARCHES

To the Editor: Cognitive decline and dementia are prevalent in elderly people, with more than 25 million individuals affected worldwide.¹ Unless new prevention strategies are discovered, the prevalence will quadruple by 2050.¹ The intriguing observation that a similar severity of dementia pathology does not necessarily result in the same level of cognitive impairment has led researchers to postulate “brain reserve” hypotheses, including the well-known “cognitive reserve hypothesis,” which states that people with higher intelligence have less cognitive decline,² and the “fetal origins hypothesis,” which states that cognitive impairment later in life has its origins in utero.³

Similar claims have been made about physical activity. A growing body of evidence from animal and human studies suggests that physical activity positively affects brain plasticity and cognitive function. For example, exercise was found to increase proliferation and survival of neurons in the dentate gyrus of the adult mouse hippocampus.⁴ Furthermore, an association between cardiovascular fitness and less tissue loss in multiple brain cortices was reported in older human adults.⁵ A randomized controlled trial showed that a home-based intervention program of self-chosen physical activity led to modest improvements in cognitive function.⁶ Thus, physical exercise seems to be beneficial for maintaining a brain reserve as well.

Cardiovascular and cognitive data from participants aged 60 and older in the International Nijmegen 4 Days Marches are reported on herein.⁷ These individuals, who are intrinsically motivated to exercise extensively, provide a unique sample to study the relationship between pro-

longed extensive physical exercise, associated cardiovascular fitness, and cognitive function. Every year in July, more than 40,000 participants, of whom approximately 5,000 are aged 70 and older, walk a daily distance of 30, 40, or 50 km for four consecutive days (120, 160, or 200 km in total). Many older adults have participated more than once and walk hundreds of kilometers all year round.

Data were collected 12–36 hours before the start of the first walking day. Cognition was screened using a validated Dutch version of the six-item Cognitive Impairment Test (CIT, range 0–28),⁸ which assesses orientation in time, verbal encoding, working memory, and delayed recall of verbal encoding. Correct answers were scored 0; the more errors a participant made, the higher her or his score. Various physiological parameters were measured, including body mass index and blood pressure (Table 1). Total CIT scores were dichotomized (0 vs ≥ 1) because they were right skewed. Associations between dichotomized total CIT scores and individual physiological parameters were examined using logistic regression analysis. $P \leq .05$ was considered significant. The medical ethical committee approved the study, and all participants gave informed consent.

Data were collected from 78 individuals. Eight individuals with an incomplete CIT were excluded, leaving 70 participants; slightly more than one-third were female, and one-third had no errors on the CIT. Table 1 shows participants' demographic and physiological characteristics. A significant association was observed between walking speed on the first day and performance on the CIT; faster walking speed was associated with fewer errors on the CIT (Table 1). Walking speeds on the second, third, and fourth days were not further studied because they were highly correlated with walking speed on the first day (Pearson correlation coefficients 0.94, 0.88, and 0.81, respectively).

The significant association between walking speed and cognitive function observed in older participants of the International Nijmegen 4 Days Marches is important because there is evidence that walking speed is an indicator of physical fitness in later life. A pooled analysis showed walking speed to be predictive of survival in people aged 65 and older.⁹ Walking speed is likely to be predictive of survival because it places demands on multiple organs, including the lungs, and on the musculoskeletal¹⁰ and nervous¹¹ systems. As such, walking speed may

Table 1. Descriptive Statistics and Associations Between Physiological Parameters and Dichotomized Cognitive Impairment Total Test Score (0 vs ≥ 1)

Variable	Mean \pm Standard Deviation	Odds Ratio (95% Confidence Interval)	P-Value
Age	72.1 \pm 10.2	1.02 (0.97–1.07)	.46
Body mass index, kg/m ²	25.2 \pm 3.0	0.97 (0.82–1.14)	.67
Abdominal circumference, cm	91.2 \pm 10.6	0.98 (0.93–1.02)	.30
Waist circumference, cm	97.1 \pm 7.0	0.98 (0.91–1.05)	.50
Waist-to-hip ratio	0.94 \pm 0.08	0.04 (0.00–18.4)	.31
Fat, %	30.0 \pm 7.1	1.00 (0.94–1.08)	.93
Systolic blood pressure, mmHg	141.3 \pm 17.9	1.01 (0.98–1.03)	.74
Diastolic blood pressure, mmHg	82.3 \pm 10.3	1.02 (0.97–1.07)	.56
Mean arterial pressure, mmHg	102.0 \pm 11.9	1.01 (0.97–1.06)	.61
Heart frequency, beats/min	66.9 \pm 13.6	1.01 (0.98–1.05)	.47
Walking speed on first day, km/h	4.2 \pm 0.8	0.38 (0.18–0.82)	.01

be indirectly, through the health of other organs on which the brain relies, and more directly linked to cognitive function in later life.

Furthermore, this finding complements the positive effects of physical exercise on cognition previously found in intervention studies conducted in older adults who exercise less extensively than the current study participants. Longitudinal follow-up studies examining the utility of extensive exercise, walking speed, and an array of associated physiological parameters in predicting preservation of cognitive function over time, in large samples of older adults who are intrinsically motivated to exercise extensively and sedentary controls, are therefore worthwhile to pursue.

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CASE REPORTS

BRYANT SIGN IN AN ELDERLY WOMAN

To the Editor: Bulging and ecchymosis of the groin and labia majora is rare. Labia majora ecchymotic swelling may indicate a bowel hernia, an abscess, acute pancreatitis, or even life-threatening retroperitoneal hemorrhage.^{1–3} Bowels herniated into the patent processus vaginalis can become strangulated and ischemic. Labia majora ecchymosis (female version of Bryant sign (scrotal ecchymosis))⁴ is seldom mentioned in the literature. Herein is reported a strangulated indirect inguinal hernia with the presentation of Bryant sign in an elderly woman. The incarcerated ischemic bowels were reduced and resected.

CASE PRESENTATION

An 87-year-old woman with diabetes mellitus and hypertension for which she was receiving treatment was sent to the emergency department for abdominal pain and vomiting. Physical examination revealed tenderness over the right lower abdomen and tachycardia but no fever. Dark red discoloration (ecchymosis) and swelling of right groin and labia majora were noted (Figure 1A). Contrast-enhanced computed tomography revealed a herniated sac with small intestinal loops in the right inguinal area with outside air pockets, suggesting bowel perforation (Figure 1B). Her mental status deteriorated and sepsis developed progressively. Emergency laparotomy showed a segment of incarcerated ileum through the patent processus vaginalis into the labia major with hemorrhagic necrosis (Figure 1C), which also caused bowel obstruction. Ileal segmentectomy and side-to-side anastomosis were performed. The right labia majora ecchymosis disappeared 2 days after the procedure (Figure 1D). Aspiration pneumonia that resolved after tracheostomy complicated her postoperative course.

DISCUSSION

Bryant sign in women, such as this case, is a rare and atypical presentation of a strangulated inguinal hernia. Women have a lower incidence of inguinal hernia than men with an estimated lifetime risk of inguinal hernia repair of 27% for men and 3% for women.⁵ Groin hernias