

# Health Literacy and Moderate to Vigorous Physical Activity During Aging, 2004–2013



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**Introduction:** Health literacy (the ability to read and understand health information) may help to support sustained participation in moderate to vigorous physical activity (MVPA) during aging; this relationship has never been examined longitudinally. This study aimed to investigate the relationship between health literacy and participation in weekly MVPA over an 8-year period among older adults.

**Methods:** Data were from interviews with 4,345 adults aged 52–79 years in the English Longitudinal Study of Ageing from 2004/2005 to 2012/2013, analyzed in 2015. Health literacy was assessed in 2004/2005 as reading comprehension of a medicine label, defined as “low” ( $\leq 2/4$  items correct); “medium” (3/4); and “high” (4/4). The outcome was maintaining weekly MVPA at all of five time points from 2004/2005 to 2012/2013. A population-weighted logistic regression model was adjusted for sociodemographic, physical health, and cognitive (memory and verbal fluency) covariates.

**Results:** Overall, 72% (3,128/4,345) of the sample had high health literacy; 18% (797/4,345) had medium health literacy; and 10% (420/4,345) had low health literacy. Of those with high health literacy, 59% (1,840/3,128) consistently reported weekly participation in MVPA, compared with 33% (138/420) of those with low health literacy (AOR=1.37, 95% CI=1.04, 1.80). Better memory was weakly positively associated with long-term MVPA (AOR=1.03, 95% CI=1.00, 1.05, per point increase out of 24), as was better verbal fluency (AOR=1.05, 95% CI=1.01, 1.09, per point increase out of 9).

**Conclusions:** High health literacy and good cognitive function are independently associated with participation in weekly MVPA over an 8-year period during aging.

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## Introduction

Health literacy is increasingly recognized as an influence on health.<sup>1,2</sup> Although many definitions of health literacy exist, a basic definition of “functional” health literacy is “the degree to which individuals can obtain, process, understand, and communicate about health-related information and services to make informed health decisions.”<sup>3</sup> According to a

national assessment of adult literacy, 10%–13% of American adults aged 16–64 years and 29% aged  $\geq 65$  years have “below basic” health literacy and are often unable to properly self-manage their health.<sup>4–8</sup> Improvement of the health literacy of the population is therefore a Healthy People 2020 goal.<sup>9</sup> Of particular concern are older adults, who are vulnerable to low health literacy because of the negative effects of cognitive aging on health literacy skills.<sup>10–12</sup> Health literacy is important for health in older age, a period in life when physical, social, and material limitations often increasingly affect one’s capacity for health self-management.<sup>13</sup> Indeed, low health literacy has been independently associated with increased risk of all-cause mortality in older adults in several contexts.<sup>14–17</sup>

Health-promoting lifestyle behaviors, such as engagement in moderate to vigorous physical activity (MPVA),

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may be mediators on the pathway from low health literacy to greater all-cause mortality risk.<sup>17,18</sup> Low MVPA is robustly associated with increased risk of all-cause mortality in older adults.<sup>19–22</sup> Health literacy may positively affect knowledge, motivation, and self-efficacy for physical activity, which are important factors in the initiation and maintenance of MVPA.<sup>18,23–27</sup> However, evidence on the relationship between health literacy and MVPA is sparse. An American study of Medicare enrollees and a United Kingdom general population survey both found no association between health literacy and weekly physical activity.<sup>28,29</sup> By contrast, an American study of hypertensive patients from federally qualified health centers and a Dutch study of community dwelling adults found that health literacy explained a modest proportion of variance in physical activity, with self-efficacy acting as a mediator.<sup>23,30</sup> Health literacy was also positively associated with physical activity in the Rush Memory and Aging Project.<sup>31</sup> These studies were cross-sectional and did not adjust for physical or cognitive health, which are major limitations in behavioral studies of health literacy. The potential contribution of cognitive function is salient to consider, given its association with health literacy and emerging relationship with physical function and activity in later life.<sup>11,32,33</sup>

This study aimed to prospectively investigate the association between health literacy and weekly participation in MVPA among older English adults from 2004 to 2013, while accounting for sociodemographic factors, physical health, and cognitive function.

## Methods

### Study Sample

The English Longitudinal Study of Ageing (ELSA) is a cohort of English adults aged  $\geq 50$  years.<sup>34</sup> The ELSA was approved by the London Multicentre Research Ethics Committee (MREC/01/2/91) and informed consent was obtained from all participants. The cohort was established in 2002 based on a random stratified sample of households in England. Data are collected in biennial waves. The present analysis was conducted in 2015 using data from Waves 2 (2004/2005) through 6 (2012/2013). Eligible participants were non-cognitively impaired “core” ELSA participants aged 52–79 years at Wave 2, who completed data collection at all waves with non-proxy interviews (proxy interviews were conducted for institutionalized or physically or cognitively impaired participants). Wave 2 was the baseline for this analysis, as health literacy was first measured in this wave. Hence, the lower limit of the eligible age range was 52 years, rather than 50 years. Of the 11,392 core participants recruited in Wave 1, a total of 8,780 were present in Wave 2 (77%). Of these, 7,659 were aged 52–79 years at Wave 2. Of these, 4,470 remained in the study and completed data collection at all waves through Wave 6 (58%). Of these, 116 (3%) had proxy interviews in at least one wave and were ineligible. In total, 4,354 participants were eligible for this analysis.

### Measures

Functional health literacy (referred to hereafter as “health literacy”) was assessed in the in-person study interview at Wave 2 (2004/2005) using a validated four-item measure from the Organisation for Economic Co-operation and Development International Adult Literacy Survey.<sup>35</sup> Participants were presented with a fictitious medicine label and were asked four reading comprehension questions (Appendix, available online). Health literacy was scored as “high” (4/4 correct); “medium” (3/4 correct); or “low” ( $\leq 2/4$  correct).<sup>17</sup> Of the 4,354 eligible participants, six refused the assessment and were excluded and 70 were unable to complete the assessment owing to sight, health, or reading problems. The latter individuals were included and coded as having low health literacy, as they would likely perform with low health literacy in real-life settings.<sup>7</sup>

Aspects of cognitive function that are essential for everyday functioning and sensitive to decline during aging were assessed in the study interview at Wave 2 (2004/2005).<sup>36</sup> Aspects of cognitive function that would be minimally affected by literacy skills were included: time orientation (continuous, out of 4 for the ability to state the correct day, week, month, and year); immediate recall (continuous, out of 10 aurally presented words); delayed recall (continuous, out of the same 10 aurally presented words); and verbal fluency (continuous, the number of animal names listed in 1 minute). The former three variables were grouped together to create a memory index, with possible scores ranging from 0 to 24.<sup>37</sup> The latter variable was coded as 0, 1–7, 8–12, 13–15, 16–17, 18–19, 20–21, 22–24, 25–29, and  $\geq 30$  animals and scored from 0 to 9.<sup>37</sup> A measure of mental processing speed was not included as it required literacy skills by assessing the number of Ps and Ws crossed out in a grid of random alphabet letters.

Physical activity was assessed in the study interview at each wave, where participants were asked about their typical frequency of participation in mild, moderate, and vigorous sports and activities, with examples given on show cards (Appendix, available online). Response options were *hardly ever or never*, *one to three times a month*, *once a week*, and *more than once a week*. At each wave, physical activity was coded dichotomously as engagement in MVPA once per week or more versus less than once per week.<sup>22,38</sup> The outcome variable was consistent weekly participation in MVPA at every wave from 2004/2005 to 2012/2013 (yes versus no).

Sociodemographic covariates were assessed in the Wave 2 (2004/2005) interview: age (continuous); sex (male, female); marital status (married or living as married; single, divorced, or widowed); net non-pension wealth (calculated in quintiles stratified at age 65 years to account for the effect of retirement on wealth); education (degree level, up to degree level, no qualifications); and ethnicity (white, non-white). Other covariates were those known to be associated with health literacy or with MVPA in the ELSA: working status (yes versus no); access to a car when needed (yes versus no); self-rated health (excellent/very good/good versus fair/poor); having a limitation in one or more instrumental activities of daily living (yes versus no); having a limiting long-standing illness (yes versus no); and presence of depressive symptoms defined as scoring  $>4$  on the 8-item Centre for Epidemiological Studies Depression Scale (yes versus no).<sup>39,40</sup>

### Statistical Analysis

The final sample was 4,345/4,354, as six participants declined the health literacy assessment and a further three were missing

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