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Childhood characteristics and participation in Scottish Mental Survey 1947 6-Day Sample Follow-ups: Implications for participation in aging studies

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ABSTRACT

Given the 'graying' of especially the populations of most western nations, studies of factors contributing to well-being in later life are important and common. It is important to their accuracy that they be based on samples representative of the populations in the relevant age groups. There is general awareness that several characteristics such as sex, socioeconomic status, cognitive ability and personality are associated with study participation, but many researchers assume that this reflects life circumstances at time of recruitment rather than inherent individual characteristics that shape those circumstances throughout people's lives. The Scottish Mental Survey 1947 6-Day Sample Follow-up study offered an unusual opportunity to test this assumption, as follow-up study participation data were available both in young adulthood and at age 77. Participation at age 77 was dramatically restricted relative to that in young adulthood. Cognitive abilities and a composite of conscientiousness-related variables independent of cognitive ability assessed in childhood predicted participation at young ages, but much more strongly at older ages. Evidence was available that these results were not specific to the recruiting and assessment methods used in this study. This suggests that participation in studies of aging is a function not just of contemporaneous circumstances but also of early-life cognitive and personality characteristics that have shaped those circumstances.

1. Introduction

The populations of most nations are 'graying' rapidly, especially those of western nations. That is, the proportion of the world's population that can be considered in old age is growing rapidly (United Nations, 2009). Because declines in physical health, well-being, and cognitive function in old age are common, there is great interest in identifying factors contributing to healthy aging, and studies in this area are frequent and ongoing. It is important to their accuracy that such studies be based on samples that are representative of the populations in the relevant age groups (Menard, 2002; Taris, 2000). There is a general awareness that several characteristics such as sex, socioeconomic status, cognitive ability and personality are associated with study participation (Menard, 2002; Taris, 2000), but many researchers assume that this reflects life circumstances at time of recruitment rather than inherent individual characteristics that shape those circumstances throughout people's lives (Nishiwaki, Clark, Morton, & Leon, 2005). Many also assume that similar characteristics are involved in participation across age groups, and affect it to similar degrees.

The question of sample selectivity, however, has attracted increasing attention (e.g., Hunt & Madhyastha, 2008; Murray, Johnson, McGue, & Iacono, 2014; Rabbitt, Lunn, & Wong, 2008), especially in epidemiological studies. These studies tend to focus on participation rates, in hopes that, if recruitment has been broad and participation rate is high, the sample will be population-representative. Population-representativeness can be partially verified, when relevant population registry data are available, and/or some random group of non-participants can be persuaded to complete an abbreviated version of the assessment (Stang, 2003). These solutions are not ideal, however, as population registries rarely compile information on the kinds of individual psychological characteristics that cause people to balk at participating, and those who are willing to complete an abbreviated assessment likely differ from those who are not. Another approach is to make statistical adjustments to study estimates using sensitivity analyses (e.g., de Luna & Lundin, 2014), simulations of potential bias in participation (e.g., Roth et al., 2014), and/or techniques such as propensity score matching (e.g., Boutwell, Beaver, & Barnes, 2012). All of these techniques require quantitative assumptions, however, and it is often difficult to evaluate the extent to which these assumptions may hold.

The potential for sample selection to create bias is especially acute in longitudinal studies because whatever characteristics affect participation rates at time of recruitment tend also to affect willingness to complete follow-up assessments (Menard, 2002; Stang, 2003; Taris, 2000).

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This causes samples to become increasingly more selective over time. Often this means increasing selection on the characteristics that drove initial participation, but it can also mean introduction of new selection characteristics when there is sufficient time between assessments that systematic changes in participants' life circumstances take place. For example, at age 52, when most people are still actively employed and may be at the peaks of their careers, with offspring still at home or being supported at university, the factors that drive willingness to participate in a research study may be related to competing professional and personal time demands that do not apply 15 years later, when many would have retired and most offspring likely achieved independence, but health limitations may have begun to have relevance. This can be especially problematic when samples span large age ranges at each assessment (Sliwinski, Hoffman, & Hofer, 2010).

Tendency for people with higher cognitive abilities to be more likely to participate in research studies is one of the sample selection processes that has been studied most extensively. This makes the studies in this area a good sample of the state of the art. Most studies that have addressed whether study samples were selected for higher cognitive ability have found evidence that they were, and that the selection became more extreme with each assessment wave in longitudinal studies (e.g., Beaver, 2013; Cooney, Schaie, & Willis, 1998; Dykiert, Gale, & Deary, 2009; Nishiwaki, Clark, Morton, & Leon, 2005). Consistency of results has not been uniform, however (e.g., Kerr, Lambert, & Bem, 1996; Lynam, Moffitt, & Stouthhammer-Loeber, 1993), and degrees of selection tend to vary with participant age, in general becoming more extreme with increasing age. There are at least two reasons for this (Johnson, McGue, & Deary, 2013). First, people with greater cognitive ability tend to be more interested in and more likely to appreciate the importance of scientific research, and, second, people with greater cognitive ability tend to be more likely to survive in good health from one age to another, increasingly so with greater age (Calvin, et al., 2011). Samples that can be used to evaluate the extent to which this phenomenon reflects stable cognitive abilities across the lifespan and compare participation rates in different phases of adulthood, however, are rare, as are samples that can be used to examine other psychological characteristics for analogous properties. Moreover, few studies can be considered truly population-representative even when initial recruitment takes place in childhood, so bases of comparison can generally only be relative. The purpose of this study was to explore participation selection effects of cognitive ability, personality, and other personal characteristics in an unusually population-representative sample initially surveyed in childhood, followed through young adulthood from ages 14 to 27, and then re-recruited at age 77.

2. Method

2.1. Participants — the 6-Day Sample and follow-up studies

In 1932 and 1947, the Scottish Council for Research in Education (SCRE) conducted Mental Surveys of almost all children born in 1921 and 1936, respectively, who were attending schools in Scotland (Scottish Council for Research in Education, 1933, 1949). The purpose of the first survey in 1932 (n = 87–498) was to observe the population distribution of cognitive ability; the second in 1947 (n = 70,805) was conducted to examine to what degree the population distribution might have changed. Extensive efforts were made to test all schoolchildren in Scotland born in the targeted years, even when they were in remedial or special education programs or suffered other disabilities. This makes these two samples among the most completely population-representative ever. A representative sample of participants in this second survey, born on the first three days of each month of 1936 (thus effectively randomly selected with respect to any variable related to cognitive ability), and their families and teachers completed a more extensive Sociological Survey at age 14 in 1950. Participants born on the first day of any even-numbered month received an additional cognitive assessment and were re-assessed annually on a number of factors from ages 15–27 (1951–1963). These 1208 (618 female) participants were called the 6-Day Sample (MacPherson, 1958; Maxwell, 1969). The additional assessments were administered by teachers, educational psychologists, and survey administrators representing SCRE, who visited and surveyed participants' homes and interviewed their parents and sample members themselves, and by head teachers while participants were at school. The assessments included further psychological measures of intelligence and personality, details of socioeconomic circumstances, school attendance, and, after participants left secondary school details of further schooling, employment, marriage and family.

In 2012, the original 6-Day sample participants were traced through United Kingdom and Scottish population records, recording deaths and their causes and locating as many of those surviving as possible (Brett & Deary, 2014). In late 2012 and 2013, located participants residing in Scotland, England, or Wales received a postal recruitment invitation explaining a follow-up study to explore health status, demographic circumstances, psychological characteristics, well-being and attitudes toward life at age 77, and their associations with the data collected in the earlier assessments. The invitation included a self-administered assessment package. Participants were requested to return a one-page form indicating willingness (or not) to participate, and to return the assessment package by mail when it was completed.

Of the original 1208 participants, 417 were deceased (164 females), 68 could not be located, and 89 had emigrated from the United Kingdom. The remaining 635 (including 1 earlier emigrant; 370 females) were invited to participate; 1 had emigrated, 2 were deceased, and 20 were deemed not capable by English/Welsh law since they had been located. No replies were received from 205 despite follow-up mailing, 138 refused participation, and 205 indicated willingness to participate, either by completing the one-page form or telephoning the study office. The primary reason for refusal was lack of interest. Completed assessments were received from 171 (90 females), for a participation rate of 27% of those invited. This participation rate may sound low, but the efforts involved in locating or accounting for all the original participants of the unusually population-representative 6-Day Sample were extensive, including matching to National Health Service medical records.

2.2. Measures

Participations in the 13 follow-up young-adult assessments to the original 6-Day Sample Study (n = 1208) following the Scottish Mental Survey of 1947 (SMS1947) from 1951 through 1963, and the age-77 Follow-Up Study (n = 171) was were the primary outcomes we analyzed. We studied the associations between participation patterns in these subsequent follow-up waves and relevant variables from the original 6-Day Sample childhood assessment, including the following:

Moray House Test #12 (MHT). Most (1112) of the 6-Day Sample participants completed the MHT on June 4, 1947 as part of the SMS1947, when they were age 11. The MHT (Scottish Council for Research in Education, 1933) is a valid, group-administered test of cognitive ability, requiring 45 min to administer. It consists of 71 items. Verbal reasoning items predominate, but there are, some numerical and other types of items. It generates a maximum score of 76. Of the 75,211 born in 1936, 70,805 received the test; those who did not complete it were not in attendance at school on the day of administration. SMS1947 was thus effectively an assessment of cognitive ability in the whole relevant population.

Terman–Merrill IQ Test—1937 Revision (TMIQ). Participants in the 6-Day Sample also completed the individually-administered L form of the TMIQ (Scottish Council for Research in Education, 1949). One