Data Article

A dataset on body composition, strength and performance in older adults

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A R T I C L E   I N F O

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A B S T R A C T

This article presents a dataset of body composition, strength and performance measurements in older adults; the data were collected as part of Rancho Bernardo Study (RBS), a longitudinal observational cohort study. All community dwelling adults in Rancho Bernardo, California between 1972 and 1974 were eligible for participation in the study. A subset of the participants returned every four years for subsequent visits. The dataset in this publication consists of some of the measures taken in Visits 7–10, for 1466 subjects who had at least one of these measures taken. We analysed the data with a feed-forward loop model fitted by structural equation modelling. The data can be valuable for modelling and extracting further information on how body composition, strength and performance affect each other over a long period of time. The data are analysed and interpreted in the research article RoyChoudhury et al., 2019.

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1. Data

The dataset consists of measurements from 1466 subjects. The first column lists non-identifiable Subject ID; Columns 2–16 list demographic variables, physical characteristics and medical history of the subjects (sex, diabetes status, hypertension, history of cancer, history of bypass surgery, weekly alcohol consumption, weight, height, history of stroke, smoking status, age, BMI, handedness, history of pain, history of surgery); Columns 17–33 list measures of physical performance and strength (ability to perform single-chair stand, limping, ability to perform tandem-walking, timed-up-and-go time, grip
Tables 1–4 present the result of feed-forward loop analysis on appendicular lean mass (ALM), grip strength (GS), subtotal lean mass/fat ratio (LFR), and timed-up-and-go time (TUG). Table 1 presents the parameter estimates and p-values for a feed-forward loop analysis between ALM and GS. Table 2 presents the parameter estimates and p-values for a feed-forward loop analysis between LFR and GS. Table 3 presents the parameter estimates and p-values for a feed-forward loop analysis between ALM, TUG and GS. Table 4 presents the parameter estimates and p-values for a feed-forward loop analysis between LFR, TUG and GS.

2. Experimental design, materials, and methods

2.1. Experimental design

All community dwelling adults living in Rancho Bernardo, California during 1972–1974 were eligible to participate [1]. For each participant, demographic information, physical characteristics, personal and family medical and health history were collected in the first visit. Some of the participants returned for subsequent visits approximately every four years [2]. This dataset consists of some measures collected in Visits 7–10.

2.2. Materials and methods

There were 1466 subject with at least one measure taken during visits 7–10. The current dataset presents raw and processed measures of body composition, grip strength and physical performance for these subjects.

Body composition was measured by fan-beamed dual energy x-ray absorptiometry (DXA) with the model Hologic 2000 (Hologic, Inc., Bedford, MA, USA).

Grip strength was measured by handheld dynamometer (Sammons Preston Rolyan, Bolingbrook, IL, USA). For each subject, grip strength was measured twice for each hand; the maximum value for each hand was recorded. The current dataset only contains the average of the maximum grip strength of the two hands.

Table 1
Appendicular lean mass → grip strength → appendicular lean mass.

| Appendicular lean mass (g) | Grip strength (kg) | Appendicular lean mass (g) |
|----------------------------|-------------------|---------------------------|
| \(\beta_{A \rightarrow G}\) | 0.14 ± 0.01       | <0.001                    |
| \(\beta_{G \rightarrow A}\) | 0.81 ± 0.01       | <0.001                    |

Table 2
Lean mass/fat ratio → grip strength → lean mass/fat ratio.

| Lean mass/fat ratio (log2) | Grip strength (kg) | Lean mass/fat ratio (log2) |
|---------------------------|--------------------|---------------------------|
| \(\beta_{L \rightarrow G}\) | 0.03 ± 0.01       | <0.001                    |
| \(\beta_{G \rightarrow L}\) | 0.92 ± 0.01       | <0.001                    |
For the timing in Time “Up and Go” Test (TUG), the subjects were asked to stand up from a chair, walk 3 m, and return back to the chair, to a sitting position. Each subject performed this test twice, and the times were recorded. The current dataset only contains the average of the two times.

2.3. Statistical modeling

We used two- and three-variable feed-forward loop models to analyze the feed-forward loop relationships between grip strength, appendicular lean mass, subtotal lean/fat ratio, and TUG. Here is a description of the models, which were fitted using the R package “sem”. Each variable was standardized separately for each visit, before the analyses were performed.

Following [4], the series of two variables \((X_t, Y_t)\) is said to have a feed-forward loop relationship (with \(X-\) \(\rightarrow\) \(Y-\)) if all three of the following conditions are satisfied.

\[
X_{t+1} = \beta_{11} X_t + \beta_{12} Y_t + \epsilon_{1t}
\]
\[
Y_{t+1} = \beta_{21} X_t + \beta_{22} Y_t + \epsilon_{2t}
\]

\(t = 1, \ldots , T - 1\), where, \(\beta_{kl}\) (\(k = 1, 2, l = 1, 2\)) are parameters with \(\beta_{12}, \beta_{21} \neq 0\), and \(\epsilon_t = (\epsilon_{1t}, \epsilon_{2t})\) are independent and identically distributed (iid) bivariate random variables. No intercept term is used because that would introduce a trend among \((X_t, Y_t)\). The outcome variables are represented by \(X_t\) and \(Y_t\), with \((X_1, Y_1), (X_2, Y_2), \ldots, (X_T, Y_T)\), representing measurement for \(T\) consecutive time points. Thus, each subject has a set of observations \((X_i, Y_i), (X_i, Y_i), \ldots, (X_i, Y_i)\), \(i = 1, 2, \ldots, n\). If both of \(\beta_{12}\) and \(\beta_{21}\) are significant, then the existence of a feed-forward loop will be concluded.

We generalize this concept to three-variable loop model. The series of three variables \((X_t, Y_t, Z_t)\) is said to have a feed-forward loop relationship (with \(X-\) \(\rightarrow\) \(Y-\) \(\rightarrow\) \(Z-\)) if all three of the following conditions are satisfied.

\[
X_{t+1} = \beta_{11} X_t + \beta_{12} Y_t + \beta_{13} Z_t + \epsilon_{1t}
\]
\[ Y_{t+1} = \beta_{21} X_t + \beta_{22} Y_t + \varepsilon_{2t} \]
\[ Z_{t+1} = \beta_{32} Y_t + \beta_{33} Z_t + \varepsilon_{3t} \]

\( t = 1, \ldots, T - 1 \), where, \( \beta_{kl} (k = 1, 2, 3; l = 1, 2, 3) \) are parameters with \( \beta_{13}, \beta_{21}, \beta_{32} \neq 0 \), and \( \varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t}) \) are independent and identically distributed (iid) trivariate random variables. No intercept term is used because that would introduce a trend among \((X_t, Y_t, Z_t)\). The data from \( n \) subjects may be represented as \(((X_{i1}, Y_{i1}, Z_{i1}), (X_{i2}, Y_{i2}, Z_{i2}), \ldots, (X_{iT}, Y_{iT}, Z_{iT})), i = 1, 2, \ldots, n\). If all three of \( \beta_{13}, \beta_{21} \) and \( \beta_{32} \) are significant, then the existence of a feed-forward loop will be concluded.

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**Conflict of Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Appendix A. Supplementary data**

Supplementary data to this article can be found online at [https://doi.org/10.1016/j.dib.2019.105103](https://doi.org/10.1016/j.dib.2019.105103).

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