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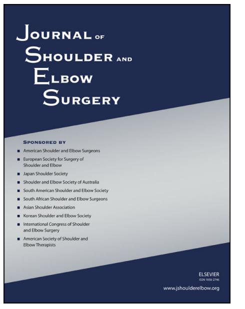

Normalization of the Constant score in the Spanish population

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Normalization of the Constant score in the Spanish population

Run head title: Normal values of the Constant score

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Abstract

Background: Normal Constant score values for healthy shoulders can vary between regions and change over the years as life expectancy increases and physical condition improves. Spain's population is one of the healthiest and has one of the highest life expectancies in the world, which could be reflected in its normal Constant score values. The purpose of this study is finding the normal Constant score values in the Spanish population.

Methods: Cross-sectional study completed between 2023-2024, including subjects older than 18 years of age without any previous or ongoing shoulder condition. Constant score was taken for both shoulders of every subject. A stratified analysis of total and subtotal scores was performed, grouping subjects by age and sex.

Results: A total of 505 subjects and 1010 shoulders were included, with a mean age of 52.3 ± 18.6 years and men/women ratio of 39.6%/60.4%. Five groups were formed according to age: 18-30 years-old (18.4%), 31-45 years-old (16.4%), 46-60 years-old (29.8%), 61-75 years-old (23.7%), and over 75 years-old (11.7%). Each of these groups were divided in two groups according to sex, making a total of 10 groups. Mean Constant score was 88.9 ± 10.9, the group of men between 18-30 years-old having the highest mean score (99.2 ± 3.0) and the group of women over 75 years-old having the lowest mean score (75.3 ± 8.8). A statistically significant inverse correlation was found between total score and age ($r = -.47$, $p < .001$). Total score was also significantly lower in the women (84.5 ± 8.2 vs 92.6 ± 8.5, $p < .001$). The decrease in mobility ($r = -.45$, $p < .001$) and strength ($r = -.40$, $p < .001$), and the difference in strength between the men and the women (10.6 ± 3.8 vs 6.0 ± 2.0, $p < .001$) were the main underlying causes of the difference in total Constant score between groups.

Conclusion: Normal values of the Spanish version of the Constant score in healthy shoulders of the Spanish population decrease with age and are lower in women, the main differences being found in shoulder mobility and strength. Global scores found in this population are higher than those previously published for English, American, and Swiss populations.

Level of evidence: Basic Science Study; Validation of Outcome Instrument

Keywords: Constant score, Constant-Murley score, Normalization, Normal, Spain, Spanish.

The Constant score (CS) is a shoulder function measurement tool developed by Christopher Constant while he was working on his university thesis in 1986.[2] On this scale, 0 points would correspond to a completely disabled and painful shoulder, and 100 points to a healthy shoulder. However, it is important to address the limitations of the original idea that a score of 100 points universally represents a healthy shoulder. Physiological differences across different population groups- due to factors such as age and sex- will inevitably influence the maximum score that individuals can achieve. Thus a reduction in score does not necessarily indicate a "sick shoulder", but rather reflects these physiological variations. Therefore, for accurate interpretation of the CS and any score influenced by intra- and inter-population physiological changes, it is essential to know the normal values of the scale in different populations groups without shoulder pathology. Some authors prefer comparing the CS of the diseased shoulder with the contralateral side; however, bilateral shoulder pathology limit this approach.

Constant determined the score differences in the population he analyzed. However, geographical and temporal differences can be quite significant, particularly with recent increases in life expectancy and active aging observed in the past decade. The most recent projections estimate that Spain will be the most aged country in the world by the year 2050, when 15.7 million people will be over 65 years old (31.4% of the population, compared to the current 19.6%), and 5.8 million people will be over 80 years old (11.6% of the population, compared to the current 6%). Consequently, the normal values obtained by Constant over 30 years ago in the Irish population might differ significantly from those observed today in Spain, a country with the fifth-highest life expectancy in the world,[12] and the third-highest healthy life expectancy.[14] We believe that functional scores have unique standard results in each population and cannot be directly transposed between different countries.

To determine reference values of a scale in a population, the first step is the translation, cross cultural adaptation, and validation of the scale. This process has recently been performed for the Constant scale in Spanish,[8] and now we aim to determine normal Constant scores in a large Spanish population and to verify whether values originally established by Constant[2] correspond to shoulder function in a contemporary population. Our hypothesis is that the results for normal shoulders in the Spanish population will vary with sex and age and will differ from the values originally calculated by Constant.

Materials and methods

Cross-sectional study analyzing Constant score values in healthy individuals. After obtaining approval from the institutional review board “ethics committee for clinical research” of our center (internal code: 21/008-E), participants were recruited randomly in the outpatient department of a tertiary hospital in the city of Madrid, Spain, between March 2022 and October 2023. Patients who visited the outpatient department (outpatient clinics, hospital) for problems other than shoulder were included and also healthy volunteers from the local population. We chose the city of Madrid as representative of Spain because its population pyramid and distribution (age and sex) are similar (**Figure 1**).

Inclusion criteria were healthy Spanish volunteers older than 18 years old (skeletal maturity), who met the requirement of not having any previous shoulder pathology or surgical intervention, in addition to having sufficient cognitive capacity to perform the requested maneuvers adequately and to answer the questions included in the scale. As previously pointed out by Yian,[15] Constant's original definition of a normal shoulder[2] (painless shoulder and the patient is able to do all the activities he wishes) was considered. Exclusion criteria were: 1) diagnosed pathology (musculoskeletal or neurological) or surgeries (cervical or thoracic) that may limit shoulder function, therefore, a thorough history was taken, and physical examination performed for each patient to exclude any shoulder pathology, 2) previous shoulder surgery, 3) cognitive deficit that hinders or complicates the execution of the requested maneuvers or answering the questions included in the scale.

To exclude patients who may have been mistakenly coded as normal, the following additional exclusion criteria were included: denial of a normal and healthy shoulder, subjective experience of less than complete shoulder function without abnormalities, obtaining less than 90º of active forward flexion or abduction, obtaining less than 20º of active external rotation, achieving less than 1.5 kg of abduction force[15], and finally, having insufficient data for a complete evaluation.

The Spanish version of the CMS adapted and validated into Spanish[8] was employed. The Constant scale was administered by evaluators who were all specifically trained in conducting this scale. Additionally, although the validated version of the scale has supplementary data with explanation and Figures (see supplementary data online at https://doi.org/10.1016/j.jse.2023.01.032. Appendix 1), to minimize interobserver variability in measurements, an example of the evaluation process with the Constant scale was recorded on video by one of the main investigators and used as a guide for the rest of the evaluators. To establish the score, four sections will be considered according to the original scale and validated version. Joint balance was measured using a digital goniometer and a Lafayette Hand-Held Dynamometer model 01165 (Lafayette Instrument, Lafayette, IN, USA) was used to measure force.

Researchers used REDCap (Research Electronic Data Capture), software that allows the design of databases for clinical trials and translational research and complies with all legal requirements regarding data security and protection. The data collected and recorded included demographic variables: educational level (primary, secondary, tertiary), type of employment (manual worker, office worker, homemaker, retired, unemployed, student), handedness (right-handed/left-handed), relevant history, and the CS with every item.

Statistical analysis

The sample size was calculated based on a previous study in the Spanish population to determine reference values for strength according to age and gender.[1] Using data from a pilot study, the authors calculated the sample size required for the 2-tailed finite population study with different power values to detect statistically significant differences similar to those observed in the pilot study at a p-value <.05 using the following formula: $n= N\sigma^2Z^2(N-1)e^2+\sigma^2Z^2$ where n was the sample size, "N" was the size of the universal population, "Z" was the upper .025 percentage point of the standard normal distribution, "e" was the desired power, and "σ" was the standard deviation. According to this formula, 401 patients were necessary. Patients were divided after recruitment into the most relevant population strata by sex and age (a total of 10 strata resulting from the combination of male/female and 18-30/30-45/45-60/60-75/>75 years).

Statistical analysis was performed using IBM SPSS (version 23.0; IBM Corp., Armonk, NY, USA). Descriptive statistics (mean and standard deviation, minimum, maximum, and 95% confidence interval) were calculated for the whole sample and for each age and sex group. A mixed regression analysis model was used to assess the effect of age, gender, and shoulder side (left or right) on the Constant score. For hypothesis testing on variables with two groups, the Student's t-test was used, and for variables with more than two groups, the ANOVA test. For non-parametric variables, the Mann-Whitney and Kruskal-Wallis tests were used instead. A p-value $<.05$ was considered statistically significant.

Results

Demographic results

A total of 505 healthy subjects were recruited randomly for this study and both shoulders were included. This yielded assessments for 1010 normal shoulders with 305 (60%) females. The mean age of the entire cohort was 52 ± 18.57 (range 20-93). Demographic data are summarized in **Table 1**.

Global Constant score

The mean Constant score was 88.9 ± 10.9 (100 points maximum). Distribution of Constant score by age group and sex for left and right shoulders is summarized in **Table 2**. Both men and women showed a sharp fall in Constant score around the sixth decade (**Figure 2**).

The correlation analysis between age and total score demonstrated a moderately inverse association between the two, with a Pearson correlation coefficient of -.47 ($p < .001$). **Figure 3** represents the scatter plot of the correlation between both variables.

The global Constant score also varied significantly based on other demographic and epidemiological variables, such as gender, presence of diabetes mellitus, attained educational level, and employment. However, no significant differences between dominant-side and nondominant-side Constant scores were found (**Table 3**).

Range of motion

The average score for the "mobility" section in the Constant scale was 37.39 ± 3.68 points (40 points maximum). The correlation analysis between age and mobility score demonstrated a moderately inverse association between the two, with a Pearson correlation coefficient of -.446 ($p < .001$). A decrease in shoulder flexion (r -.386), abduction (r = -.373), external rotation (r = -.401), and internal rotation (r = -.372) with age was also demonstrated ($p < .001$). There were no significant differences between men and women in terms of score in the "mobility" section (37.52 ± 3.25 vs 37.31 ± 3.92, p = .3836).

The analysis of the different ranges of motion, stratified by age, sex, and side, is summarized in **Table 4**.

Strength

Regarding strength measurements, the mean score in this section was 16.08 ± 5.93 points (25 points maximum), with a mean value of 7.8 ± 3.7 kg. **Table 5** summarizes mean exerted force in kilograms, according to sex, age, and side.

There was a decline in strength with age, which was more pronounced after age 60 (r = -.3955; $p < .001$). There were also significant differences between men and women, in the strength section of the Constant score (23.4 ± 13.1 vs 13.1 ± 4.4, $p < .001$) and in measured force (10.6 ± 3.8 kg vs 6.0 ± 2.0 kg, $p < .001$). The correlation between strength loss and age was much higher in men (r = -.6486, $p < .001$) than in women (r = -.4886, $p < .001$).

Discussion

Relevance of the study

Although normative data scores are essential for researchers and clinicians to facilitate interpretation of outcomes, using these values from a population with different characteristics to the one we are studying is meaningless. No reference values for the Spanish population have been previously provided, however geographical and temporal differences can be so significant (especially in the country with the fifth highest life expectancy at birth and with the seventh highest healthy life expectancy)[16] that using reference values from a different population could bias the results. Indeed, this work was conceived when, after conducting several research works related to shoulder problems in the Spanish population, we observed that, especially in the elderly population, the adjusted Constant score calculated with historically proposed normative data originally described by Constant in 1986 increased our Constant score in some cases above the maximum possible. This point has been previously noted by other authors during normalization of the scale.[7] The results of the present study may be used to define adjusted or normative values when using the Constant score to define shoulder outcomes in the Spanish population.

Previous normalization scores

The normalization process of the Constant scale was first conducted by Constant in 1986.[2,3] To address this issue, he measured the shoulders of 900 patients in an orthopedic outpatient clinic and in-patient population of a geriatric hospital. In 2003, Grassi et al[5] calculated the reference values in 563 patients for an Italian population and later in 2005, normal values for the Swiss population[15] with measurements in 1620 clinical patients and a control group of 115 healthy volunteers, and (measurements) for the Chicago population (Illinois, United States) in 441 patients who attended a sports medicine clinic[7] were published. In 2007, Walton et al[13] and in 2009, Tavakkolizadech[10] report gender specific Constant score values for a London population in 108 and 270 healthy subjects respectively. Finally in 2022 Gahlot et al[4] report references values for the Indian population in 248 patients aged 18 to 78 years. **Table 6** summarizes comparison of the mean reference Constant scores between the current study and the previous in different demographic populations.

Many of the previously mentioned studies that have conducted normalization of the Constant scale for different populations were methodologically flawed due to the use of scales not previously validated for their population and the use of non-standardized methods for measuring strength.[3,5,7,13,15] Others were methodologically flawed due to the absence of a clear definition of the study population,[5] or conducting the study in a biased entry population.[7] Finally, in other cases, the exclusion criteria were not strict enough to prevent the inclusion of pathological shoulders allowing the physician, rather than the patient, to decide if the shoulders were normal, which is inconsistent with the definition below of a “normal” shoulder provided by Constant, or including patients with shoulder pain.[7,13]

Methodology

Before proceeding with normalization of the Constant scale, we conducted the transcultural adaptation and validation of the test to standardize the procedure and reduce biases.[8] Additionally, the sample size calculation was based on previous investigation[1] of determining variations in shoulder strength based on age and gender for the Spanish population through a pilot study that provided an estimate of the variability and dispersion, allowing the sample size calculation to be more accurate. Finally, strict exclusion criteria to rule out any volunteers with shoulder morbidities, pain, loss of movement, or any limitation of activities of daily living were included. We adopt

Constant's definition of a "healthy shoulder", where no shoulder pain is admitted; however, perhaps this should be a point of discussion to consider. As previously mentioned, people are living longer and more active lives, it is challenging in any geriatric population to find a shoulder without pain (15 points in the Constant scale), excluding many patients, especially those older than 75, with mild pain that did not affect the performance of any of the patients' activities and did not even require the use of analgesics. Therefore, perhaps we should redefine Mr. Constant's concept of a "healthy shoulder" for the current population because otherwise, we may exclude many patients from that "normality". Soldatis et al[9] performed outcome measures (Rowe, ASES, UCLA, Constant-Murley, and SST) on 190 healthy collegiate athletes to determine the presence and severity of shoulder symptoms in a normal population similar to an active-duty military population. They showed that significant shoulder symptoms existed in this normal population and increased with shoulder dominance. They discovered that 46% of all shoulders showed some degree of pain, equating to a less than perfect score.

After the present work we propose the following definition: "a healthy shoulder is one that allows the patient to perform all the activities they want to and either does not present pain, or presents mild levels that do not require the use of analgesics, the patient themself considering their shoulder to be 'normal'." With this definition, unlike Constant's, the patient does not have to score 35 points in the subjective evaluation and may obtain a lower score (between 30-35). Finally, the present work identified a population with a manageable size that could be representative of the population profile. The city of Madrid, and the healthcare area studied exhibited this profile with very similar sex and age distribution (population pyramid).[17,18]

Global Constant score

Previous research has assumed that achieving a perfect score indicates normalcy. Our results illustrate that outcome scores deviate from a perfect score even in a young, active population with no shoulder symptoms or pathology with an average global Constant score not reaching 100 points in any age group, which is similar to findings of other researchers.[6,7,15] This highlights the importance of gathering additional demographic information when interpreting scores.

This study shows the clear relationship between age and decreasing Constant score for the Spanish population. This agrees with similar findings in previous studies of different populations,[3,5,7,11,15] which originally noted an initial increase and maintenance of shoulder function and strength with age, followed by a dramatic and steady decline in women aged over 40 years and men aged over 60 years. Similarly, Grassi et al[5] observed a decreasing trend beginning at 50 years of age for men and 30 for women, and Katolik[7] also noted a decrease in global Constant score and strength at 70 years. We observe a deterioration in Constant scores and strength in slightly older male and female patients (>75 years). The abovementioned characteristics of healthy life expectancy in our country probably play a role in this regard. Previous studies on the normalization process justify the overall decrease in Constant score mainly due to the decrease in strength. However, in our study, the item that contributed the most to the overall score decrease with age was range of motion, followed by strength (r -.4465 vs -.3955; p<.001).

The results of our study, like a previous study,[6] demonstrate the difference between genders (females have lower global Constant score) which confirms the need to generate reference norms stratified by both characteristics: age and sex. Interestingly, as in Constant's study[2], Yian's study,[15] and as per Hardy et al,[6] we did not detect significant differences in overall scores between dominant and nondominant sides.

The present study has important limitations. The sample size, although much higher than previously reported, was relatively small. Another limitation of the present study is the potential for selection bias, and the fact that most of the patients in this study were accrued from health centers, hospitals, and specialist centers. However, despite these constraints as explained previously, the data reasonably reflects the target population. Finally, the definition of a non-pathologic shoulder was based on patient perception as the cost of MRI or ultrasound to conclusively exclude shoulder pathology in all the subjects would have been non-viable.

Conclusion

Using Constant's original normal values for the calculation of the relative Constant score can overestimate shoulder function. The Constant score in the Spanish population decreases over the years due to decline in strength, but above all, due to decreased mobility. The influence of demographic and temporal variables on Constant scores emphasizes the importance of comparing a patient's function with reference scores from a similar population sample.

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Figure and Table legends

Figure 1. Population pyramid (age and sex distribution) of the Community of Madrid (green) and National total (red). Source: *https://www.ine.es/covid/piramides.htm#*

Figure 2. Representation of the mean Constant scores, stratified by age, sex, and side.

Figure 3. Scatter plot showing age and Constant score correlation.

Table 1. Demographic data of the entire cohort.

Table 2. Distribution of Constant score by age and sex groups and for left and right shoulders.

Table 3. Comparative analysis of the global Constant score according to demographic variables.

Table 4. Distribution of range of motion by age and sex groups and for left and right shoulders.

Table 5. Distribution of exerted abduction force in kilograms by age and sex groups, and for left and right shoulders.

Table 6. Constant score comparison between published normalized data in every age group.

Sex, male / *female*	39.6 (200) / 60.4 (305)
Age, years**	52.31 ± 18.57
Age groups*	
18 – 30	18.4 (93)
31 – 45	16.4 (83)
46 – 60	29.8 (150)
61 – 75	23.7 (120)
>75	11.6 (59)
Handedness* *right-handed / left-handed*	93.7 (473) / 6.3 (32)
Educational level*	
Primary	25.3 (128)
Secondary	26 (131)
Tertiary	48.7 (246)
Employment*	
Manual worker	31 (157)
Office worker	26.8 (135)
Homemaker/housewife	5.9 (30)
Retired	21.6 (109)
Unemployed	4.2 (21)
Student	10.5 (53)

*Cualitative variables are expressed as "percentage (nº of subjets)". **Cuantitaive variables are expresed by "mean ± standard deviation.

Age group	Male		Female	
	Right	*Left*	*Right*	*Left*
18 – 30	99.16 ± 3.02	99.16 ± 3.08	90.14 ± 5.01	90.15 ± 4.10
31 – 45	95.42 ± 5.32	96.37 ± 5.15	87.38 ± 6.15	87.54 ± 5.64
46 – 60	91.96 ± 10.47	93.51 ± 7.12	84.33 ± 8.37	84.57 ± 8.42
61 – 75	90.32 ± 7.64	91.03 ± 8.16	81.74 ± 6.63	81.98 ± 7.03
>75	84.75 ± 7.60	82.99 ± 8.13	75.41 ± 9.58	75.23 ± 8.14

Results are expressed as "mean ± standard deviation"

	Constant score	p value
Sex, *male / female*	92.6 ± 8.5 / 84.5 ± 8.2	< .0001
Side, *right / left*	87.6 ± 9.4 / 87.9 ± 9.1	.6033
Handedness, *right / left*	87.5 ± 9.3 / 90.5 ± 7.0	.0140
Dominant shoulder, *yes / no*	87.6 ± 9.3 / 87.9 ± 9.1	.6864
Diabetes, *yes / no*	84.5 ± 9.3 / 88.1 ± 9.1	.0001
Hypothyroidism, yes */ no*	86.8 ± 6.9 / 87.8 ± 9.3	.3408
Highest level of Education		
Primary	82.7 ± 10.9	
Secondary	87.6 ± 8.6	< .0001
Tertiary	90.2 ± 7.2	
Employment		
Manual labor	87.7 ± 10.2	
Office work	89.7 ± 7.0	
Domestic work	82.9 ± 8.2	< .0001
Retiree	83.5 ± 9.3	
Unemployment	85.1 ± 8.4	
Student	94.8 ± 5.2	

Total Constant scores are expressed as “mean ± standard deviation” for each group. Student “t” was used to test variables with two groups. sANOVA was used for variables with more tan two groups, except for the “Employment” variable, in which the Kruskal Wallis test was used since the Levene’s test showed asymmetry of variances between groups in this variable.

Age group	Male				Female			
	Right		*Left*		*Right*		*Left*	
18 – 30	F	A	F	A	F	A	F	A
	172 ± 10	171 ± 9	171 ± 10	10 ± 1	173 ± 9	170 ± 11	174 ± 9	172 ± 10
	ER	IR	ER	IR	ER	IR	ER	IR
	10 ± 0	9.8 ± 1	10 ± 0	9.9 ± 0.5	10.0 ± 0.3	9.9 ± 0.4	9.9 ± 0.4	10.0 ± 0.3
31 – 45	F	A	F	A	F	A	F	A
	166 ± 11	162 ± 12	165 ± 10	159 ± 14	166 ± 13	164 ± 13	168 ± 10	164 ± 16
	ER	IR	ER	IR	ER	IR	ER	IR
	9.8 ± 0.6	9.2 ± 1	9.9 ± 0.4	9.6 ± 0.8	9.7 ± 0.9	9.6 ± 0.8	9.8 ± 0.6	9.8 ± 0.7
46 – 60	F	A	F	A	F	A	F	A
	165 ± 14	159 ± 17	165 ± 12	159 ± 16	163 ± 17	159 ± 20	161 ± 17	160 ± 19
	ER	IR	ER	IR	ER	IR	ER	IR
	9.4 ± 1.4	8.8 ± 1.2	9.5 ± 1.1	9.3 ± 1.2	9.3 ± 1.4	9.0 ± 1.5	9.3 ± 1.1	9.4 ± 1.2
61 – 75	F	A	F	A	F	A	F	A
	165 ± 13	161 ± 18	163 ± 13	159 ± 16	161 ± 14	157 ± 18	159 ± 17	157 ± 21
	ER	IR	ER	IR	ER	IR	ER	IR
	9.4 ± 1.4	8.4 ± 1.4	9.3 ± 1.3	9.2 ± 1.2	8.9 ± 1.7	8.7 ± 1.4	9.2 ± 1.4	9.1 ± 1.3
> 75	F	A	F	A	F	A	F	A
	155 ± 13	147 ± 15	156 ± 11	147 ± 16	152 ± 16	145 ± 22	148 ± 17	144 ± 20
	ER	IR	ER	IR	ER	IR	ER	IR
	8.7 ± 1.3	8.4 ± 1.3	8.4 ± 1.1	8.7 ± 1.2	7.9 ± 1.9	8.2 ± 1.6	7.6 ± 1.9	8.9 ± 1.4

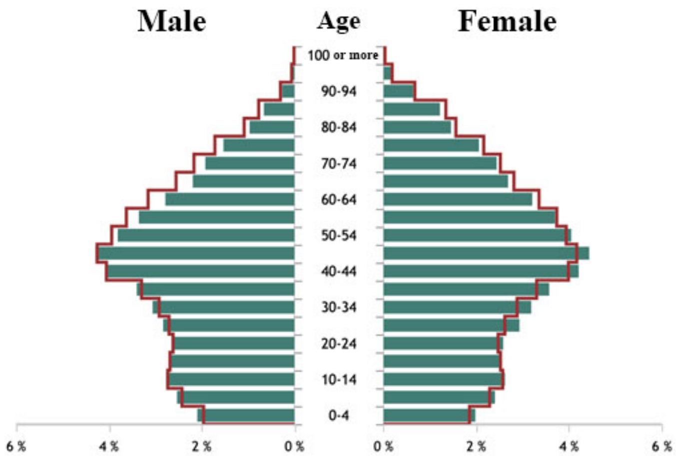
F: flexion. A: abduction. ER: external rotation. IR: internal rotation.

All measurements are expressed as “mean ± standard deviation”. Flexion and abduction are expressed in degrees of range of motion, while rotations (since they were evaluated functionally and quantitatively) are expressed as a score from 0 to 10 according to the functional gestures described in the Constant score.

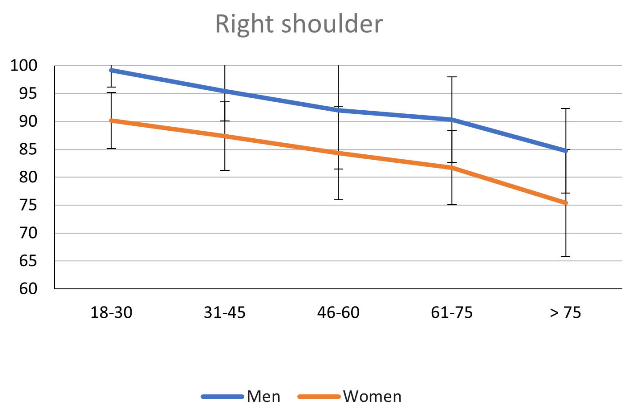
Age group	**Male**		**Female**	
	Right	*Left*	*Right*	*Left*
18 – 30	14.7 ± 3.4	14.3 ± 3.0	7.4 ± 2.0	7.2 ± 1.9
31 – 45	12.3 ± 3.4	12.3 ± 3.3	6.7 ± 1.6	6.5 ± 1.8
46 – 60	10.4 ± 3.3	10.5 ± 3.2	6.1 ± 1.8	6.0 ± 1.9
61 – 75	9.2 ± 2.9	9.1 ± 2.7	5.7 ± 1.6	5.1 ± 1.6
> 75	7.0 ± 2.0	6.6 ± 2.3	4.0 ± 1.2	4.0 ± 1.2

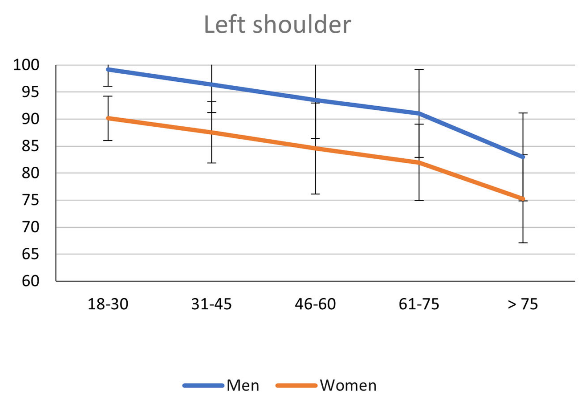
Results are expressed as “mean ± standard deviation” in kilograms

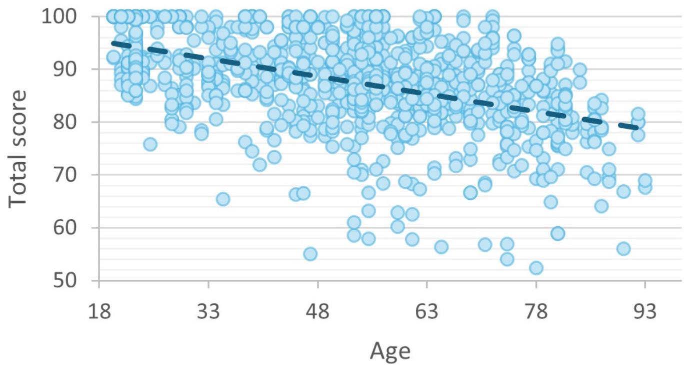
Age group	Male						Female					
	Constant[X]	Yian[x]	Katolik[x]	Tavak.[X]	Gahlot[X]	Lopiz	Constant[X]	Yian[x]	Katolik[x]	Tavak.[X]	Gahlot[X]	Lopiz
18-30	98	94	95	94	87	99	97	85	88	85	86	90
31-40	93	94	95	94	87	97	90	86	87	85	84	88
41-50	92	93	96	94	87	95	80	85	86	86	82	86
51-60	90	91	94	92	85	92	73	83	84	86	82	84
61-70	83	90	92	91	84	91	70	82	83	83	81	83
71-80	75	86	88	78	81	88	69	81	81	80	75	76
>80	75	86	88	78	81	81	69	81	81	80	75	76



Male
Age
Female
100 or more
90-94
80-84
70-74
60-64
50-54
40-44
30-34
20-24
10-14
0-4
6 %
4 %
2 %
0 %
0 %
2 %
4 %
6 %


Right shoulder
100
95
90
85
80
75
70
65
60
18-30
31-45
46-60
61-75
> 75
Men
Women


Left shoulder
100
95
90
85
80
75
70
65
60
18-30
31-45
46-60
61-75
> 75
Men
Women


100
90
80
70
60
50
Total score
18
33
48
63
78
93
Age