

Hormonal Predictors of Growth Hormone Therapy Effectiveness in Children with Short Stature - Evidence from Neural Prediction Model for Final Height

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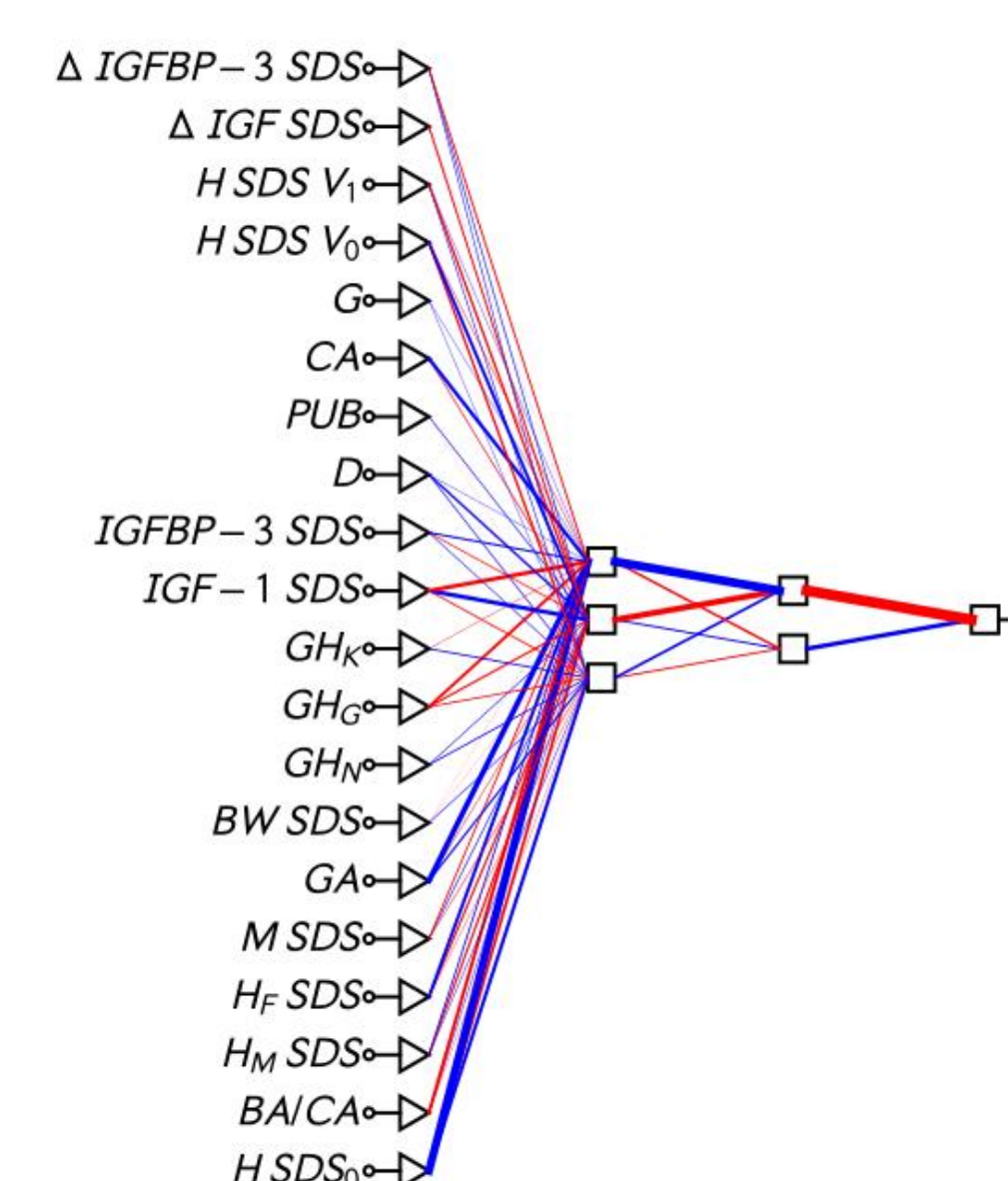
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Prediction of growth hormone (GH) therapy effectiveness in children with short stature is an important issue for optimizing its course. Recently, our research group has published prediction models derived with neural networks. The main predictors of final height (FH) in our model were: patient's height SDS at therapy onset, pre-treatment change of height SDS ($HSDS V_0$) and pre-treatment IGF-I and IGFBP-3 secretion but not the results of GH stimulation tests; the increases of IGF-I and IGFBP-3 concentrations in 1st year of GH therapy were also significant variables.

The aim of present study is to analyze the influence of IGF-I and IGFBP-3 secretion before and during GH therapy on FH in children with wide range of GH secretion.

Analysis comprised 133 children (89 boys) with short stature (101 with GH deficiency and 32 with idiopathic short stature), treated with GH up to FH. In all children 20 auxological and hormonal parameters was assessed before treatment, in 1st year of therapy and at FH:

1. Patient's height SDS before treatment ($HSDS_0$)
2. Change of height SDS in pre-treatment period ($HSDS V_0$)
3. Patient's body mass SDS ($MSDS$)
4. Patient's chronological age (CA)
5. Bone age to chronological age ratio (BA/CA)
6. Gender (G)
7. Pubertal development (PUB):
 - 0 pre-pubertal
 - 1 pubertal
8. Mother's height SDS ($H_M SDS$)
9. Father's height SDS ($H_F SDS$)
10. IGF-I concentration (expressed as $IGF-I SDS$ for age and gender)
11. IGFBP-3 concentration expressed as ($IGFBP-3 SDS$)
12. GH peak in test with clonidine (GH_{cl}),
13. GH peak in test with glucagon (GH_G)
14. GH peak after falling asleep (GH_N)
15. Birth weight ($BW SDS$)
16. Gestational age (GA)
17. Initial rhGH dose (D)
18. Patient's height SDS increase during 1st year of treatment ($HSDS V_1$)
19. IGF-I SDS increase after 3-6 months of treatment ($\Delta IGF-I SDS$)
20. IGFBP-3 SDS increase at the same time point ($\Delta IGFBP-3 SDS$).



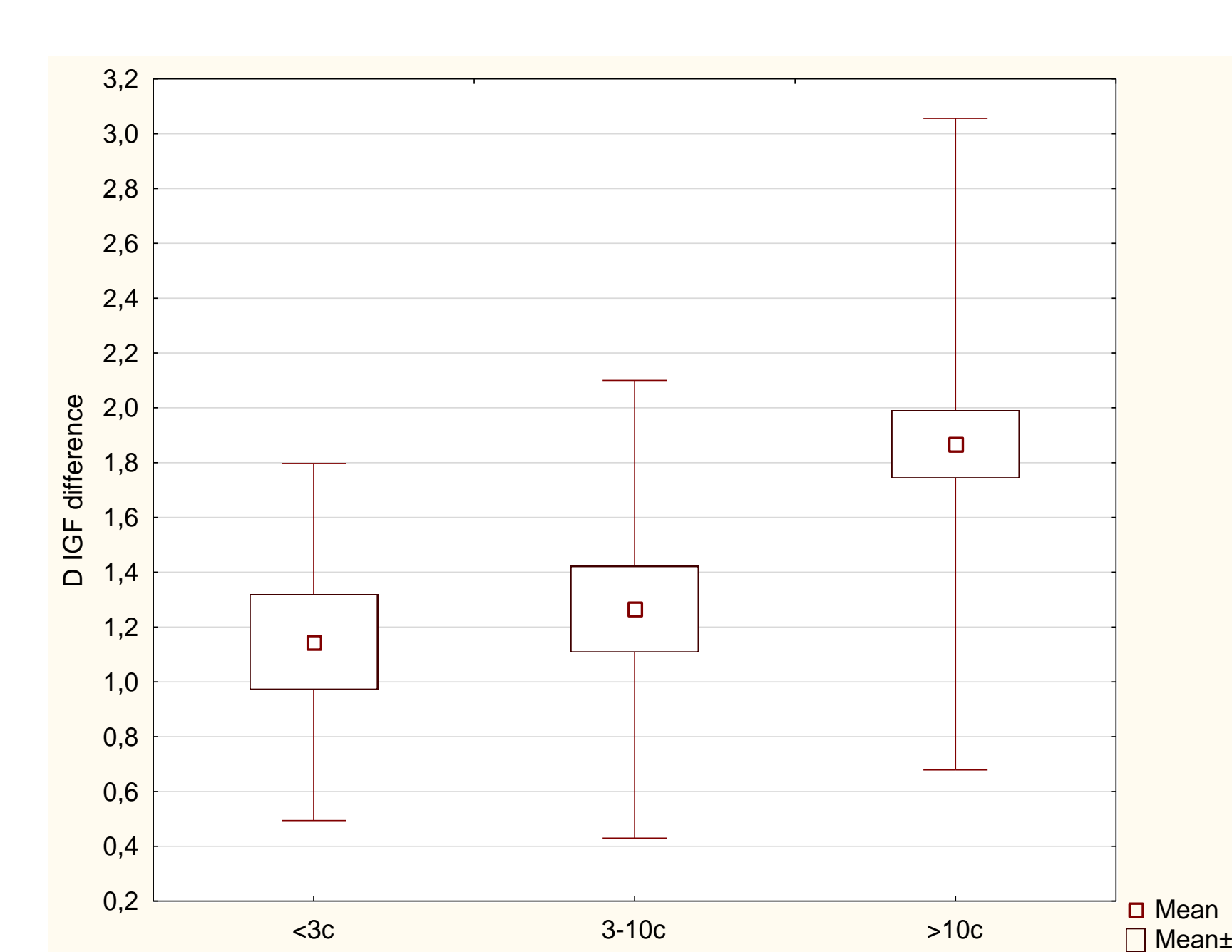
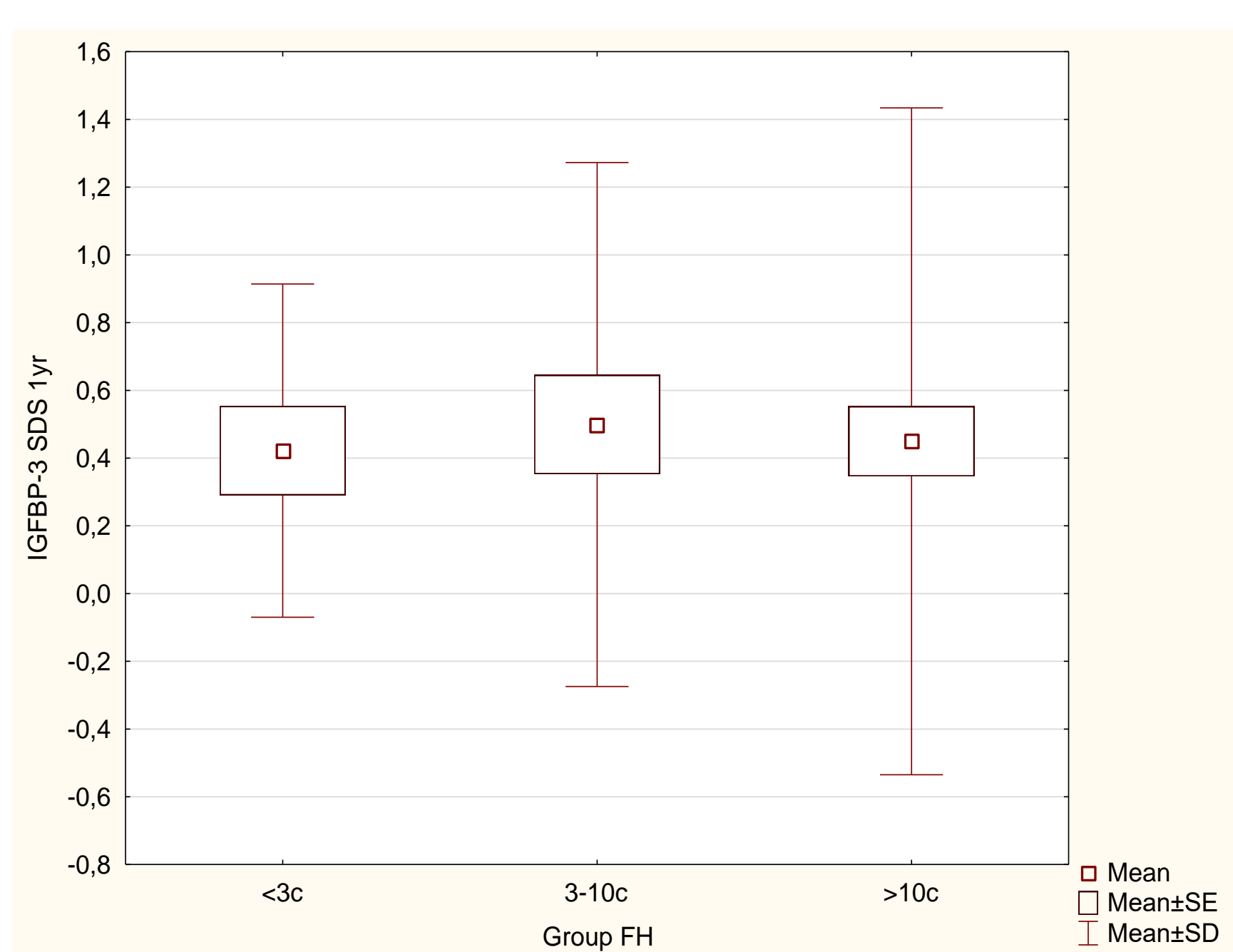
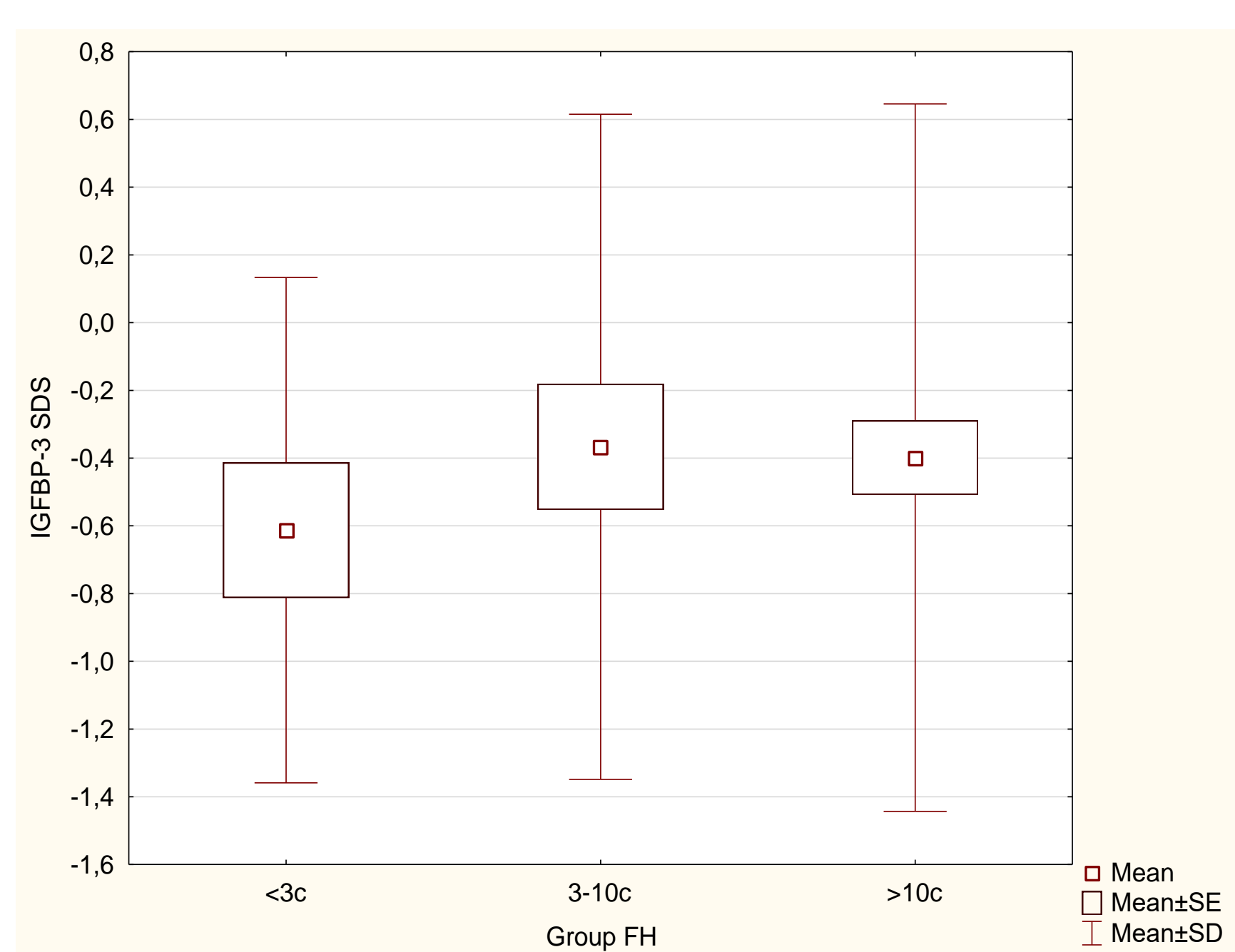
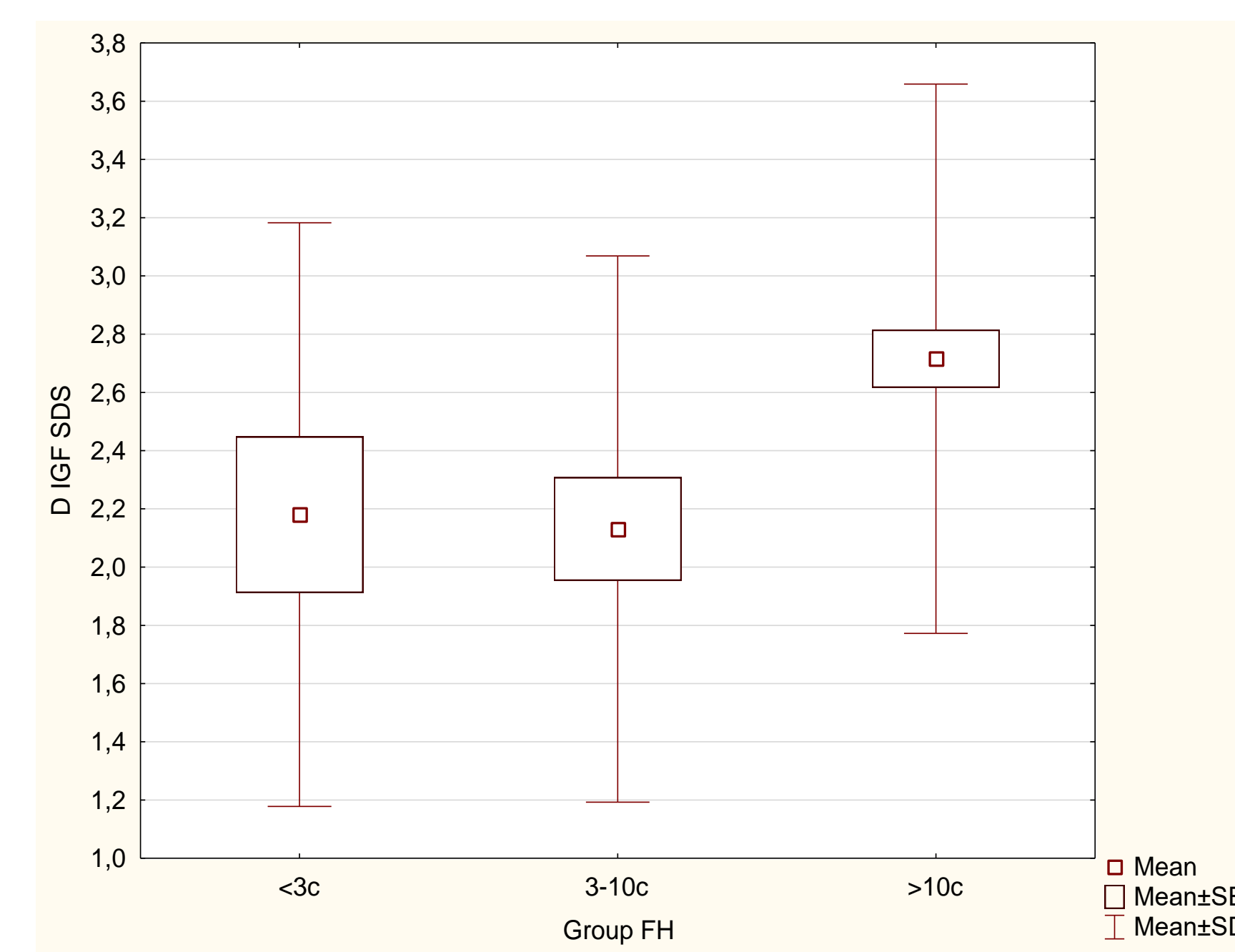
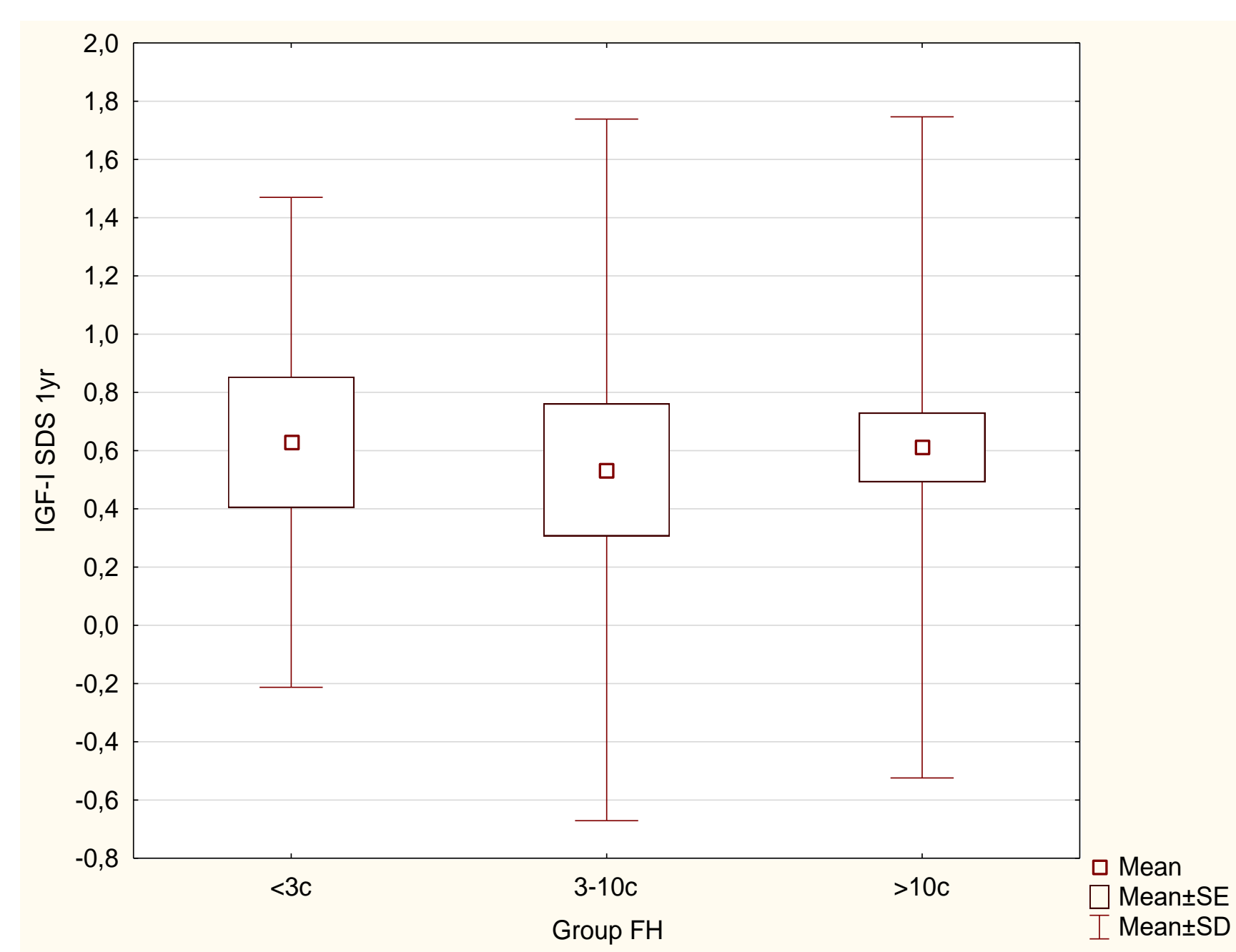
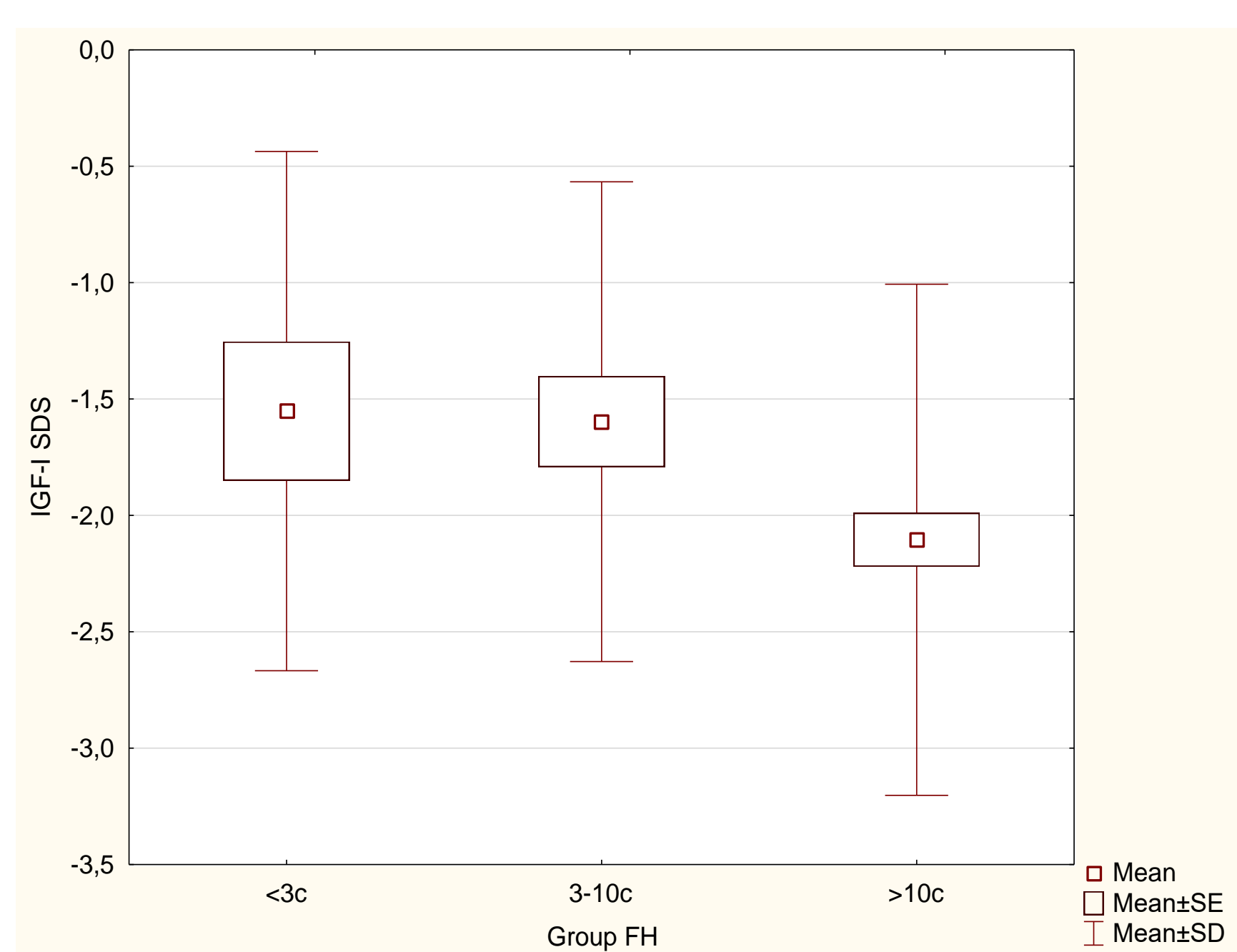
For details see:
Smyczyńska U et al.
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According to their FH, the patients were classified into 3 groups: below 3 centile (<3c), between 3 and 10 centile (3-10c) and over 10 centile (>10c). The index of difference between IGF-I SDS increase and IGFBP-3 SDS increase in 1st year of treatment (ΔIGF difference) was calculated for each patient.

At therapy onset IGF-I SDS was higher in <3c group (-1.55 ± 1.07) and 3-10c group (-1.60 ± 1.10) than in >10c group (-2.10 ± 1.09), while IGFBP-3 SDS was lower in <3c group (-0.67 ± 0.72) than in groups 3-10c (-0.37 ± 0.96) and >10c (-0.40 ± 1.04).

In 1st year of treatment there was no significant difference in both IGF-I SDS and IGFBP-3 SDS between all the groups.

The increase of IGF-I SDS was significantly ($p < 0.05$) higher in group >10c (2.72 ± 0.94) than in groups <3c (2.18 ± 0.97) and 3-10c (2.13 ± 0.92), similarly ΔIGF difference was significantly higher in >10c (1.87 ± 1.18) than in both <3c (1.15 ± 0.63) and 3-10c (1.27 ± 0.82).



Pre-treatment IGF-I and IGFBP-3 secretion and their increase during the initial phase of GH therapy are important predictors of the attained FH. Neural models are useful for the identification of variables that should be subjected to further analysis.