Quality of Life in Short Adults

Abstract
The use of (costly) growth hormone (GH) treatment in short children is often justified by the assumption that short stature considerably reduces quality of life in adults. We tested this assumption in 5 groups of short adults: 25 patients with isolated GH deficiency; 17 male patients with childhood onset renal failure; 25 women with Turner syndrome and 26 patients who were presented as a child to a paediatrician for idiopathic short stature. A group of 44 short individuals with presumably idiopathic short stature, who had not been presented to a paediatrician for short stature, was sampled from the general population (‘normal shorts’). We measured quality of life in terms of socio-economic variables, the Nottingham Health Profile and time trade-off. The mean height of most groups was close to the 3rd percentile. The chance of having a partner was low for all groups, except for the normal shorts. Problems with job application were only reported in Turner syndrome. The scores on the Nottingham Health Profile were all within the normal range, but GH-deficient adults had a higher score on the domain energy than normal shorts. Women with Turner syndrome, individuals with renal failure, and those with idiopathic short stature had a wish to be taller, with an estimated reduction in quality of life of 2–4% (time trade-off). As the normal shorts did not show any sign of a reduced quality of life, we falsify the assumption of a direct relation between short stature and quality of life. The complaints of patients with idiopathic short stature around the 3rd percentile seem to be the result of unsuccessful coping strategies.

Introduction
The main motive to start growth hormone (GH) treatment in non-GH-deficient children is the assumption that short stature reduces quality of life in childhood as well as in adulthood [1, 2]. A second assumption is that the magnitude of this effect is large enough to justify the high cost of GH treatment. However, both assumptions are mainly based on investigations in patients with severely short stature and multiple pathology, such as GH-deficient patients [3].

The conclusions from investigations on the effect of shortness on quality of life in patients with idiopathic short stature vary between a reduction and no effect.
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[1, 4–6]. This variation is probably caused, at least in part, by differences in the way the patient groups were assembled. Most studies are based on children who were presented by their parents to a paediatrician because of short stature. These children are likely to have more problems with their short stature than the average short child and are therefore not representative of all children with short stature. At the same time, their parents are expected to be more worried about this issue than parents who do not visit a paediatrician for this reason. The observation that not all short children are brought to medical attention does obviously not diminish the seriousness of the problems in those who are brought.

Studies in persons with short stature randomly sampled from the general population are rare and have only been performed in children. These studies have demonstrated that such children show only minimal differences compared to controls with respect to socio-economic variables and quality of life [7–9]. The influence of short stature on the quality of life in adults randomly sampled from the general population is so far unknown. We therefore set out to assess quality of life in short individuals with a variety of disorders, including short normal individuals who had not sought for medical treatment.

**Patients and Methods**

In order to study the influence of short stature on quality of life in adults systematically, we measured the quality of life of 5 groups of adult patients. All had an age between 18 and 40 years and had an actual height below the 10th percentile [10]. All patients received a written invitation to cooperate.

From the files of three nephrological centres, 56 patients were found. The inclusion criteria were: onset of renal failure before the age of 15 years and living with a functioning transplanted kidney at the time of investigation. Subjects suffering from renal failure during childhood; height below the 3rd percentile at the time of consultation; classical GH deficiency excluded on the basis of a normal (>20 mU/l) plasma GH response to provocation tests, and no other pathology which could explain short stature. Of 35 positive reactions, 7 respondents had grown above the 10th percentile and 2 could not be interviewed for practical reasons. Of the remaining 26 respondents had received any form of growth promoting treatment.

In addition to these patients sampled from medical files, ‘normal short’ people were sampled from the general population. For this purpose we used the files of a large epidemiological cardiovascular study in a healthy population in Zoetermeer, set up in 1975 [12, 13]. For the present study we selected from these files all individuals who were in 1975 between 4 and 18 years of age and had a height below the 3rd percentile and no disease which could explain their short stature. Of the 80 subjects with a height below the 3rd percentile 2 had died and 20 could not be traced. The remaining 58 subjects were all interviewed. Twelve of them had a final height above the 10th percentile and 2 had Down syndrome, so that 44 subjects remained for inclusion into this study. These ‘normal shorts’ can be assumed to belong to the same diagnostic group as the patients with idiopathic short stature sampled from medical files. The key difference between the two groups is that the parents of the patients sampled from the medical files considered short stature a reason to seek medical help up to the level of a paediatric endocrinologist, while the parents of the children participating in the epidemiological study did not seek help from these specialists. In a previous study [11] we found that there was no difference with respect to social data between a group of 67 short normals and 43 normal-statured controls randomly selected from the same epidemiological study [12, 13].

Interviews with a group of 74 students provided data on their experience with being teased and on their history of receiving psychological support. The students were also asked how they estimated the disutility of short stature.

Quality of life was estimated with three groups of measurements. The first consisted of socio-economic variables: educational level, occupation, problems with finding a job because of short stature, and seeking professional help for psychological problems. The second was a multidimensional quality of life questionnaire: the Nottingham Health Profile Part I [14–17]. The last group of measurements consisted of a unidimensional assessment of the impact of short stature on quality of life. First the respondents were asked if they wanted to be taller, in the present (as an adult) or in the past (as a child). The strength of the present wish was quantified by means of time trade-off [18, 19]. Time trade-off is an interview technique specially designed to quantify the value of health states for economic evaluations. If the time-trade-off is high, then high costs for treatment are more easily justified than when the trade-off is low [18]. In time-trade-off, patients are asked to indicate the maximum number of years they are willing to give up in order to avoid (or get rid of) a poor state of health. In this case the subjects were asked how many years...
they would be willing to lose at the end of their life in order to obtain an average stature. The maximum number of years patients are willing to give up is proportional to the value or utility of the quality of life in that particular health state [18, 19]. In this way time trade-off gives a quantification of the impact of short stature. This value can be compared to other diseases or handicaps. In this investigation time trade-off was also used to measure the impact on the quality of life of infertility due to Turner syndrome and the problems associated with a transplanted kidney and dialysis.

The interviewers, 2 psychologists and 1 anthropologist, made also qualitative reports about the interviews with the subjects and about their family background. Differences were judged statistically significant if the two-tailed p level was below 5%.

Results

There was no significant difference between the mean height of the GH-deficient patients, the patients with idiopathic short stature and the normal shorts. The mean height of the women with Turner syndrome and of the renal failure patients was significantly lower than the overall mean height adjusted for gender (table 1).

The chance of having a partner was low for all groups, except for the normal shorts. Differences in the presence of a partner were tested by means of a hierarchical log
Table 3. The Nottingham Health Profile

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Growth hormone deficiency</th>
<th>Idiopathic short stature</th>
<th>Turner syndrome</th>
<th>Renal failure</th>
<th>Normal shorts</th>
<th>General population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>13±24</td>
<td>4±11</td>
<td>8±24</td>
<td>11±27</td>
<td>3±15</td>
<td>12±24</td>
</tr>
<tr>
<td>Pain</td>
<td>5±20</td>
<td>0±2</td>
<td>0±0</td>
<td>2±4</td>
<td>1±3</td>
<td>7±16</td>
</tr>
<tr>
<td>Emotional reactions</td>
<td>11±25</td>
<td>2±5</td>
<td>3±7</td>
<td>3±8</td>
<td>2±7</td>
<td>8±17</td>
</tr>
<tr>
<td>Sleep</td>
<td>10±26</td>
<td>4±10</td>
<td>5±9</td>
<td>9±26</td>
<td>10±19</td>
<td>11±22</td>
</tr>
<tr>
<td>Social isolation</td>
<td>11±24</td>
<td>9±16</td>
<td>10±20</td>
<td>1±5</td>
<td>2±6</td>
<td>5±14</td>
</tr>
<tr>
<td>Physical mobility</td>
<td>7±20</td>
<td>3±6</td>
<td>1±3</td>
<td>3±7</td>
<td>2±5</td>
<td>6±13</td>
</tr>
</tbody>
</table>

The scores on the Nottingham Health Profile have a range from 0 to 100: 0 = no complaints; 100 = all complaints. Mean and standard deviation.

Table 4. Unidimensional measurements of quality of life (in %)

<table>
<thead>
<tr>
<th>Growth hormone deficiency</th>
<th>Idiopathic short stature</th>
<th>Turner syndrome</th>
<th>Renal failure</th>
<th>Normal shorts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would have liked to be taller as an adult</td>
<td>88.2 100.0</td>
<td>85.7 58.3</td>
<td>72.0 80.0</td>
<td>62.5 76.9</td>
</tr>
<tr>
<td>Would like to be taller as an adult</td>
<td>42.1 66.7</td>
<td>85.7 75.0</td>
<td>68.0 60.0</td>
<td>30.0 45.8</td>
</tr>
<tr>
<td>Proportion of subjects prepared to give up years in time trade-off</td>
<td>11.0 33.0</td>
<td>21.0 50.0</td>
<td>44.0 33.0</td>
<td>10.0 8.0</td>
</tr>
<tr>
<td>Mean time trade-off</td>
<td>0.4 1.8</td>
<td>2.0 3.8</td>
<td>4.2 4.0</td>
<td>0.7 0.4</td>
</tr>
</tbody>
</table>

linear analysis in order to adjust for any age effects (table 2). The probability of having a partner differed significantly among the groups and between men and women.

All groups reported more teasing remarks about their short stature during childhood and adulthood than the students with an average stature, but there were no statistical differences between the groups with short stature. There were no statistical differences in the proportion of subjects who had received professional psychological care between the groups and in comparison to the students. The level of education did not differ between groups with short stature. The groups did differ in the number of reported problems with job application because of short stature. Especially the women with Turner syndrome reported problems, while the short normals reported none (table 1). In spite of these reported problems, almost all respondents were employed, except for 2 renal failure patients and 3 women with Turner syndrome.

Table 3 presents the scores on the Nottingham Health Profile together with the scores of the (Dutch) general population [14]. Compared to the general population, the scores of all patient groups are close to average. The differences between groups were not statistically significant when tested multivariately (Kruskal-Wallis H). When the scores of the normal shorts were compared to each of the other groups in a univariate way, only the score of the GH-deficient patients on energy was statistically different (Mann-Whitney U, p = 0.05). However, the score in the GH-deficient patients was almost identical to that of normal-statured controls.

A large majority of the subjects would have liked to be taller during childhood (table 4). In that respect there were no differences between the patient groups. As an adult the wish to be taller was less prominent, except for the subjects with idiopathic short stature and the women with Turner syndrome. In these two groups, a large majority still wanted to be taller. The strength of this wish was measured with time trade-off. In general the trade-offs were low (table 4 and fig. 1). A large proportion of the subjects did not even start a trade-off, which caused a skewed distribution of the data. In order to test the differences statistically, subjects were divided into a subgroup who
started the trade-off and a group who did not. On this dichotomised data a hierarchical log linear analysis was performed in the same way as for the presence of a partner (table 2). Analyzed in this way, the data showed differences between groups: the GH-deficient patients and the normal shorts were hardly prepared to make a trade-off, in contrast to the patients in the other groups who were willing to make a moderate trade-off for a taller stature. The normal-statured students were asked to imagine having short stature (P3) and then asked about the time trade-off to get taller. They were not prepared to take any (imaginative) risk to increase their height.

The women with Turner syndrome made an average time trade-off for their infertility of 9%. The trade-offs for all symptoms associated with living with a transplanted kidney and living on dialysis were 15 and 47%, respectively. These trade-offs are considerable greater than the trade-offs for height, as illustrated in figure 1.

**Discussion**

In this study we assessed various aspects of quality of life of short adults, including social conditions, a general multidimensional test, and a unidimensional test of the impact of short stature. The most interesting result is that quality of life was not affected in the normal shorts sampled from the general population, while in the short adults with the same condition sampled from hospital files, social functioning appeared to be negatively affected, which was attributed to their short stature. Even in this group, however, the absence of abnormalities measured by the Nottingham Health Profile and the small number of years the subjects wished to give up in exchange for a normal stature, indicate that the impact of short stature on quality of life is small. This means that one cannot justify GH treatment in non-GH-deficient children with an expected adult stature close to the 3rd percentile just on the assumption that such short stature would generally reduce quality of life, although one should be aware that
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the impact of short stature may vary considerably between subjects.

A qualitative analysis of the interviews revealed differences in coping strategies as a possible explanation for the different results in the subjects who were presented as a child to the paediatrician, compared to the population-based sample of the normal shorts. The subjects in the first group frequently emphasized the social disadvantages of being short and they and their parents often stated that these social disadvantages dominated their social interactions. The normal shorts seldom stressed any social disadvantages. On the contrary, it was sometimes even hard to explain to them that the disadvantages of being short could be a topic for an academic study. Many normal short women even classified their stature as an advantage: short stature was considered as feminine and sexually attractive. When invited to speak about possible problems, the normal shorts typically mentioned practical problems like difficulties in finding nicely fitting clothes. Social disadvantages were denied or intentionally compensated by antagonistic behaviour. In contrast to the parents of patients who were presented to a paediatrician, the parents of the short normals did not label being short as a problem.

With regard to GH-deficient patients, there was a relatively high percentage of subjects without a partner. Moreover, in a previous study we confirmed earlier findings that GH-deficient patients had a lower income and jobs with a lower social prestige than average, although they were not more often unemployed [11]. The Nottingham Health Profile only showed increased scores on energy compared to normal shorts, in line with earlier findings [15–17]. However, the scores were similar to normal-statured controls. Recently, one of the founders of the Nottingham Health Profile warned that this instrument might not be as responsive to the specific symptoms of growth hormone deficient adults as might be suggested by its frequent use in this patient group [20].

As measured by time trade-off, the GH-deficient adults, who had received GH treatment during childhood, had no strong wish to be taller, although their mean height was close to the P3. This suggests that they were satisfied with their height after GH therapy. It is thus unlikely that the indications of a reduced quality of life as summarized above would be due to their short stature: other characteristics of GH deficiency, such as a lack of energy [21], are more likely to cause the social disadvantages of this group. In addition, the average satisfaction with their present height should not be interpreted as evidence that GH therapy could be stopped if a certain height is reached, in view of the multiple negative effects of GH deficiency in adults [21].

In contrast to the GH-deficient group and normal shorts, the women with Turner syndrome showed a clear desire to grow: 44% were prepared to make a time trade-off. This may be partially attributed to the fact that the mean height of this group was 4–6 cm lower than the other groups. Another factor may be that short stature serves as a distinguishing mark for the whole syndrome, as it is one of the most visible characteristics. During the interviews many subjects reported that they found it difficult to talk about the cause of their short stature, because they did not want to mention other, less visible characteristics, such as infertility. When the results of time trade-off for height were compared to those for infertility, it appeared that the reduction of quality of life associated with infertility was almost twice as much as that attributed to short stature. Many subjects reported that they felt insecure because of their infertility and they blamed their problems in finding a partner for it.

Also subjects with renal failure had a clear desire to grow to an average height, which may be caused by the fact that they were the shortest male patients in this study, with an average height below the 3rd percentile. They did not attribute the absence of partners to their short stature. Most of these men said that they were not a good party for a woman, because of the constant risk of losing their transplanted kidney. The results of time trade-off show that other problems associated with their kidney failure were judged to be of far more influence on the quality of life than short stature alone.

One may wonder to what extent our results may be generalized to all short individuals with the various disorders, given the fact that not all subjects responded positively to the request to participate and that the maximum number for inclusion was set to 25 subjects per group. With regard to the last aspect, which led to exclusion of a substantial number of subjects with Turner syndrome, we have no reason to believe that relatively early responders would differ from late responders in terms of quality of life. With regard to the nonresponders, no background investigations could be performed in view of privacy regulations, so that no definite statement can be made on this matter.

In conclusion, we have shown that the assumption that short stature would reduce quality of life does not hold true for each patient category and thus cannot be generally used as a motive to start growth promoting therapy. The disadvantage of short stature as reported by adults who were diagnosed in childhood with idiopathic short stature
is not representative of short people in general. However, this does not simply imply that no form of treatment is needed for such children, as without treatment a proportion of them end up attributing life problems to their shortness. This indicates that at least supportive therapy should be considered.

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References