Drawings Reflect a New Dimension of the Psychological Impact of Long-Term Remission of Cushing's Syndrome

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Context and Objective: Drawings can be used to assess perceptions of patients about their disease. We aimed to explore the utility of the drawing test and its relation to illness perceptions, quality of life (QoL), and clinical disease severity in patients after long-term remission of Cushing's syndrome.

Design and Subjects: We conducted a cross-sectional study including 47 patients with long-term remission of Cushing's syndrome. Patients completed the drawing test, the Illness Perception Questionnaire-Revised, the Short-Form 36, the EuroQoL-5D, and the Cushing QoL. The Cushing's syndrome severity index was scored based on medical records.

Results: Characteristics of the drawings were strongly associated with the Cushing's syndrome severity index and severity ratings of health professionals (all $P < 0.02$). In addition, patients perceived a dramatic change in body size during the active state of the disease compared to the healthy state before disease. Patients reported that their body does not completely return to the original size (*i.e.* before disease) after treatment. There were no clear associations between characteristics of the drawings and QoL or illness perceptions. This indicates that drawings and QoL or illness perceptions do not share multiple common properties and measure different aspects/dimensions of the disease process.

Conclusion: Drawings reflect a new dimension of the psychological impact of long-term remission of Cushing's syndrome because drawings do not share common properties with parameters of QoL or illness perceptions, but do represent the clinical severity of the disease. The assessment of drawings may enable doctors to appreciate the perceptions of patients with long-term remission of Cushing's syndrome and will lead the way in dispelling idiosyncratic beliefs. **(*J Clin Endocrinol Metab* 97: 3123–3131, 2012)**

Cushing's syndrome is characterized by excessive glucocorticoid levels, which are mostly caused by ACTH-producing pituitary adenomas. After successful treatment of hypercortisolism, signs and symptoms of the syndrome regress substantially. However, prolonged, excessive exposure to glucocorticoids may have long-lasting adverse effects on behavioral and cognitive functions, presumably due to functional and structural alterations in specific brain target areas (1–4). These patients do not completely return to their premorbid level of functioning, and quality of life (QoL) is persistently impaired despite long-term cure of Cushing's syndrome (5). In addition,

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Abbreviations: QoL, Quality of life; VAS, visual analog scale.

these patients show subtle cognitive impairments, increased prevalence of psychopathology, use ineffective coping strategies, and have negative perceptions about their own health despite long-term remission of glucocorticoid excess (3, 4, 6, 7).

The drawing test is a novel method to assess the illness perceptions patients have about their disease. Patients are asked to draw a picture of their body or their disease. It is presumed that drawings can illustrate their notions in a more concrete and specific way than words, *i.e.* questionnaires or structured interviews that are limited by operating along predefined dimensions (8, 9). In addition, drawings can be useful in identifying idiosyncratic beliefs that can play a critical role in illness perceptions, medication compliance, self-management skills, and QoL (10). These idiosyncratic beliefs are hard to explore by standard questionnaires.

The drawing task has successfully been applied in several other conditions, including myocardial infarction (8, 10), heart failure (9), headache (11), postpartum hemorrhage (12), vestibular schwannoma (13), and systemic lupus erythematosus (14). These previous studies showed that drawings illustrate the psychological and functional status of the patient. In addition, the drawings appear to be at least as strong predictors of the course of illness compared with more or less "objective" characteristics of the disease. In a prospective study in patients with cardiovascular disease, it was shown that the degree of damage depicted by patients on these drawings at the time of hospital discharge after myocardial infarction was a better predictor of recovery than clinical indicators of myocardial injury (10). Considering these observations in non-endocrine conditions, the question arises to which extent this drawing task can be applied in endocrine conditions associated with major physical and psychological changes (3–7). There are no previous studies in which drawings have been used to assess the perceptions of patients with endocrine diseases. Therefore, the aim of the present study was to explore the utility of drawings of patients after long-term remission of Cushing's syndrome. We hypothesized that these drawings reflect impaired QoL, altered illness perceptions, and possibly the clinical status of the disease.

Patients and Methods

Design

We performed a cross-sectional study in which patients in long-term remission after treatment of Cushing's syndrome were invited to draw three images of their body (see *Drawing test*). Inclusion criteria were age above 18 yr and prolonged remission of Cushing's syndrome (*i.e.* >1 yr). The protocol was approved by the institutional Medical Ethics Committee of the Leiden University Medical Center.

Patients

A clinical chart review of 77 consecutive patients who had been cured from Cushing's syndrome in our center was performed. Thirty patients (39%) declined to participate for several reasons including old age and/or debilitating disease. Forty-seven patients (61%) participated in the current study. Seven patients (15%) had Cushing's syndrome caused by an adrenal adenoma, and 40 patients (85%) suffered from pituitary-dependent Cushing's disease. The seven patients with adrenal disease had been treated by adrenalectomy. The patients with Cushing's disease had been treated by transsphenoidal surgery only (n = 28; 70%); transsphenoidal surgery and bilateral adrenalectomy (n = 1; 3%); transsphenoidal surgery, bilateral adrenalectomy, and radiotherapy (n = 4; 10%); bilateral adrenalectomy and radiotherapy (n = 3; 8%); or transsphenoidal surgery and radiotherapy (n = 4; 10%). The long-term treatment outcomes of these patients have been characterized and described in detail previously (15).

Cushing's syndrome had been diagnosed based on internationally agreed guidelines, *i.e.* the clinical manifestations and positive biochemical tests including increased urinary excretion rates of free cortisol, decreased overnight suppression by dexamethasone (1 mg), and since 2004, elevated midnight salivary cortisol values. All patients had been treated by transsphenoidal surgery or bilateral adrenalectomy, if necessary followed by repeated surgery and/or postoperative radiotherapy. Cure of Cushing's syndrome was defined by normal overnight suppression of plasma cortisol levels (<50 nmol/liter) after administration of dexamethasone (1 mg) and normal 24-h urinary excretion rates of cortisol (<220 nmol/24 h). Hydrocortisone independency was defined as a normal cortisol response to CRH or insulin tolerance test ITT).

All patients were followed at our outpatient department. Patients were monitored for (recurrence of) disease, according to appropriate dynamic tests. Pituitary function was monitored, and pituitary hormone replacement was prescribed, dependent on the results of the yearly evaluation of pituitary functions. In the case of corticotrope insufficiency, confirmed by ITT or CRH test, the average dose of hydrocortisone was 20 mg/d divided into two or three doses. Evaluation of GH deficiency was performed by ITT and/or GHRH-arginine test only in patients under the age of 70 yr and only after at least 2 yr of remission. Somatotrope insufficiency was treated with recombinant human GH replacement, aiming at IGF-I concentrations in the normal range for age. In addition, free T_4 and testosterone levels (in male patients) were assessed. If results were below the lower limit of the respective reference ranges, substitution with L-T_4 and/or testosterone was prescribed. In the case of amenorrhea and low estradiol levels in premenopausal women, estrogen replacement was provided. Progesterone replacement was also provided to women with an intact uterus.

Methods

The QoL questionnaires were completed at home by the patients, followed by the Illness Perception Questionnaire Revised (IPQ-R) and the drawing test. All three drawings were made at the same time. The questionnaires and the drawing test were all sent to the patient by regular mail and included a short letter

explaining the purpose of the study. A prepaid envelope was provided to every patient to send back the questionnaires and drawings.

Drawing test

Patients were given three sheets of paper that included the following instructions: "Please draw a picture of what you think your body looked like before you were diagnosed with Cushing's syndrome (drawing 1); a picture of what you think your body looked like when Cushing's syndrome was diagnosed, before treatment (drawing 2); and another picture of what you think your body looks like currently, after treatment for Cushing's syndrome (drawing 3). We are not interested in your drawing ability—a simple sketch is fine. We are interested in what you think has happened to your body. Could you describe what you drew on the bottom of each drawing?"

Illness Perception Questionnaire Revised (IPQ-R)

The IPQ-R was used to measure current cognitive and emotional perceptions about Cushing's syndrome (16, 17). This questionnaire was developed to assess the components of the illness representation of Leventhal's Self-Regulatory Model and has been used to study illness perceptions in chronic conditions (18–22). Recently, we reported IPQ-R data in the same cohort of patients after long-term remission of Cushing's syndrome (7).

The IPQ-R is divided into three sections. The first part consists of the illness identity dimension, with a list of 14 general commonly occurring symptoms and 13 symptoms commonly present in Cushing's syndrome. Patients are asked to rate whether or not they experienced the symptoms and whether they believe the symptom to be related to Cushing's syndrome (yes/no). The summed yes-rated items of the disease-related symptoms are used in the analysis.

The second part of the questionnaire, assessing illness perception dimensions, consists of 38 statements concerning views on the illness, scored on a five-point Likert scale (from strongly disagree to strongly agree). The questions are transformed to seven dimensions: 1) timeline acute/chronic— beliefs about the chronic nature of the condition; 2) timeline cyclical— beliefs regarding the cyclical nature of the condition; 3) consequences—negative consequences of the disease; 4) emotional representations—negative beliefs about how the illness affects one's emotional well-being; 5) personal control—perceived personal controllability of the disease; 6) treatment control—perceived treatment controllability of the disease; and 7) illness coherence—personal understanding of the disease. A higher score indicates a stronger belief in that particular dimension.

QoL questionnaires

Short Form 36 (SF-36)

The SF-36 questionnaire consists of 36 items and assesses functional status during the previous month (23, 24). The items cover nine health concepts: 1) physical functioning—limitations in physical activities because of health problems; 2) social functioning—limitations in social activities because of emotional problems; 3) role limitation (physical)—limitations in usual role activities because of physical health problems; 4) role limitation (emotional)—limitations in usual role activities because of emotional problems; 5) mental health—psychological distress and well-being; 6) vitality— energy and fatigue; 7) pain; 8) general health perception; and 9) general perception of change in health. Scores are expressed on a 0–100 scale, and higher scores are associated with a better QoL. The SF-36 scores of patients with Cushing's syndrome were already described by our research group in 2005 (5). We asked patients to fill out the SF-36 again for the current study.

EuroQoL-5D (EQ-5D)

This QoL questionnaire assesses the current health status reflected in five health dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Scores are expressed on a 1–3 scale per dimension, with a higher score indicating a worse QoL. The questionnaire also includes a visual analog scale (VAS), which comprises a standard vertical 20-cm scale (similar to a thermometer) for recording an individual's rating for their current health-related QoL state (25). The VAS score ranges from 0 to 100, with higher scores indicating a better QoL.

Cushing QoL

This is a disease-specific QoL questionnaire specifically designed to assess QoL in patients with Cushing's syndrome. The questionnaire assesses disease-specific QoL during the past 4 wk and consists of 12 questions on a five-point Likert scale ranging from always to never. The questionnaire covers topics like pain, wound healing, memory, and health concerns. The total score ranges from 12–60, with a lower score indicating a greater impact on health-related QoL (26).

Cushing's syndrome severity index (CSI)

Sonino *et al.* (27) developed the Cushing's syndrome severity index (CSI), a clinical severity scale that assesses the (medical) severity of Cushing's syndrome. The CSI contains eight clinical features: 1) fat distribution; 2) skin lesions; 3) muscle weakness; 4) mood disorder; 5) hypertension; 6) diabetes; 7) hypokalemia; and 8) sex-related disturbances, with different indications for females (hirsutism, hair loss, amenorrhea) and males [decreased libido, (occasional) impotence]. Each feature is scored on an ordinal three-point scale (range, 0–2). A higher total score on the CSI indicates a higher severity, with a range of 0–16. The information necessary for completing this index is derived from clinical history and medical files. Two raters, who reached consensus on each feature of the CSI, scored the CSI. The CSI was scored retrospectively for the active phase of Cushing's syndrome, and for the last yearly evaluation of the patient. The total score of the CSI and the fat distribution subscale were used in the analyses.

Data analysis

The drawings were scanned and imported into NIH Image-J software (28). The outside parameters of the drawn body, head, and abdomen were traced and computed. In addition, two independent observers scored the symptoms shown on the drawings. Subsequently, κ scores were calculated for each symptom. When the κ was less than 0.7, consensus was reached between the raters by reanalyzing the drawings together. Furthermore, four independent health professionals (three endocrinologists, one medical psychologist) were asked to rate the severity of each drawing over the three points in time. The health professionals were all given the same instruction: "Please rate each drawing on severity (five-point Likert scale, not serious to very serious), based on symptoms and emotions you see in the drawings and

subsequently in the explanation written underneath the drawing." The mean severity rating per time point was used in the analyses.

Data were analyzed using PASW Statistics version 17.0.2 (SPSS Inc., Chicago, IL). All data are presented as mean ± SD values unless stated otherwise. The primary analysis comprised the association between the drawings and QoL, illness perceptions, the CSI, and the perceived severity judged by doctors using Pearson's correlation coefficients. Only drawing 3 (current state) and the Δ of drawing 3 *vs.* drawing 2 (*i.e.* the perceived change) were used when analyzing possible associations between the drawings and various questionnaires.

To check the normality of the data, the Kolmogorov-Smirnov test was used in addition to histograms and box plots. Extreme outliers were removed from the dataset based on the box plots. Spearman's rho correlation coefficient was used for data that were not normally distributed. χ^2 was used in case of categorical data. In addition, Δ were calculated based on percentage increase or decrease with the formula [((last measurement/first measurement) − 1)∗100].

In view of the exploratory nature of this investigation, adjustment of the level of significance for multiple testing was not performed, and the level of significance was set at $P \leq 0.05$.

Results

Sociodemographic and clinical characteristics (Table 1)

Clinical characteristics of the patients are detailed in Table 1. Thirty-seven patients (79%) with Cushing's syndrome had been treated by transsphenoidal surgery, and 10 patients (21%) had been treated by bilateral adrenalectomy. Eleven patients (24%) received additional cranial radiotherapy because of persistent disease after surgery. At the time of the current study, all patients were in remission, and the mean duration of remission was 16 ± 11 yr. Twenty-eight patients (60%) were treated for some degree of pituitary insufficiency, and 27 patients (57%) were hydrocortisone dependent.

TABLE 1. Clinical characteristics

	Patients in remission of Cushing's syndrome (n = 47)
Gender (male/female)	4/43
Age (yr)	52 (10)
Education, n (%)	Low, 14 (30%)
	Medium, 18 (38%)
	High, 15 (32%)
Transsphenoidal surgery, n (%)	37 (79%)
Adrenal surgery, n (%)	10 (21%)
Additional radiotherapy, n (%)	11 (24%)
Duration of remission (yr)	16 (11)
Hypopituitarism, n (%)	Any axis, 28 (60%)
	GH, 20 (43%)
	LH/FSH, 14 (30%)
	TSH, 17 (36%)
	ADH, 7 (15%)
Hydrocortisone substitution, n (%)	27 (57%)
CSI score, active state	7.8 (3)
CSI fat score, active state	1.7 (1)
CSI score, current state	2.8 (2)
CSI fat score, current state	0.4 (1)

Data are expressed as mean (SD) unless otherwise stated. ADH, Antidiuretic hormone; CSI, Cushing's syndrome severity index.

The CSI score (range, 0–16) in the active disease state was 7.6 ± 3, whereas the CSI score at the time of the study (*i.e.* during long-term remission) was much lower, *i.e.* 2.8 ± 2. The CSI subscale fat distribution (range, 0–2) was also lower for the condition at the time of the study compared with the active disease state (0.4 ± 1 and 1.7 ± 1, respectively).

TABLE 2. Size of drawings in pixels

	Drawing 1	Drawing 2	Drawing 3
Height body/figure	919.5 (276)	1007.5 (309)	946.1 (291)
Width body/figure	394.6 (194)	561.1 (268)	456.0 (218)
Head (width)	146.9 (56)	236.2 (92)	171.2 (60)
Abdomen (width)	170.2 (82)	319.8 (120)	240.6 (112)

Data are expressed as mean (SD).

Size of drawings (Table 2 and Figs. 1 and 2)

Table 2 shows the size of the three drawings. Figure 1 shows the relative changes in size between the drawings, with the first drawing serving as a baseline. Drawing 2 (active disease state) was significantly higher and wider than drawing 1 (healthy state before disease). The width of the head and abdomen was also greater in drawing 2 compared with drawing 1. In addition, drawing 3 (current state after disease) showed a wider head, wider abdominal width, and overall a wider picture than drawing 1. When drawings 2 and 3 were compared, drawing 2 contained a wider head, a wider abdomen, and was overall wider than drawing 3.

Figure 2 shows some examples of drawings patients made.

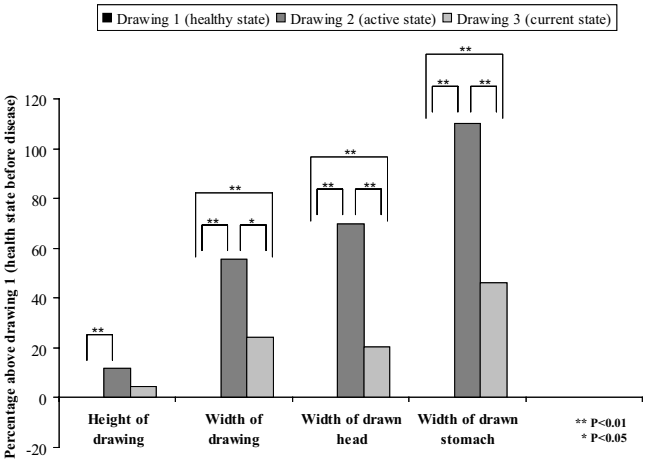

FIG. 1. Changes in size of the drawings (drawing 1 = baseline, 0%).

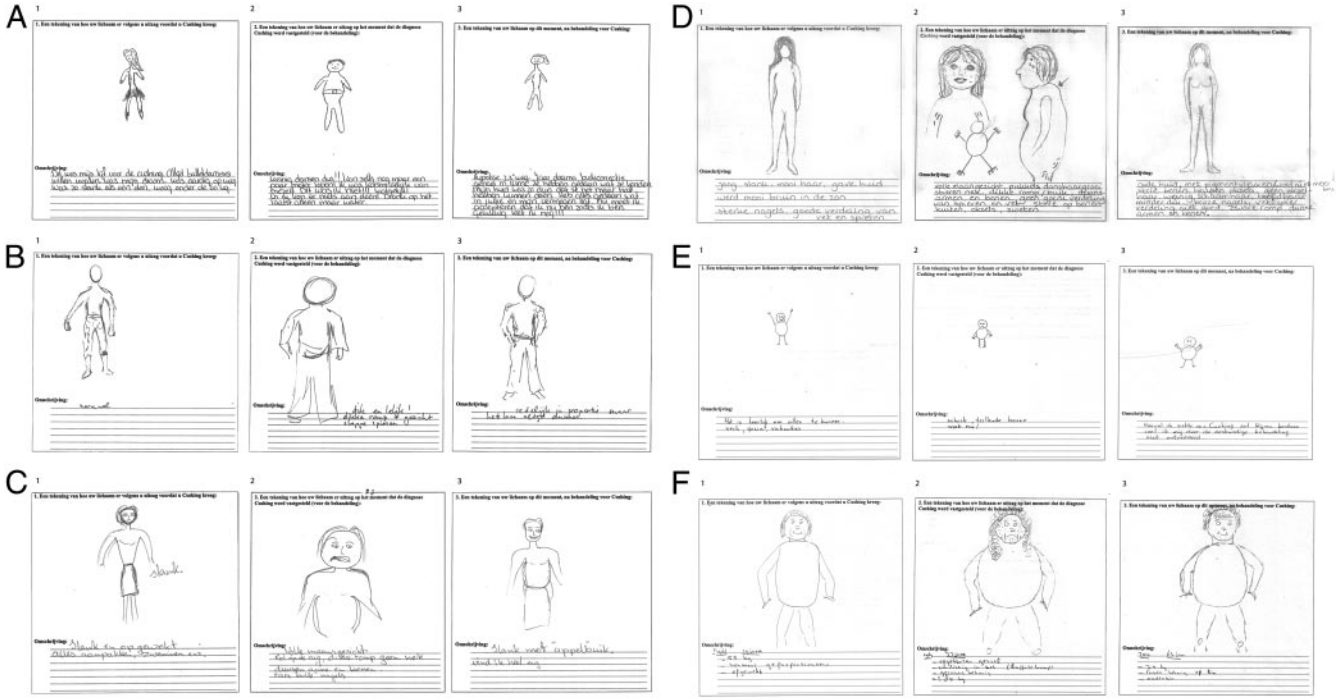

FIG. 2. Examples of drawings (1, before; 2, during; 3, after disease). Translation of patients' comments: Patient A—1, This was my body before Cushing's. I have always wanted to be a ballet dancer. This was my dream. I was on my way. I was very slender, and my weight was < 60 kg. 2, Not much dancing!! I couldn't even walk for more than a few meters! I was very sick of myself. This wasn't me!! Disgusting! And there was nothing I could do about it! I only drank water in the end. 3, Two third of my pituitary is removed. The year after, I had an abdominal correction at the LUMC. They did what they could; my skin was so thin that they could only do half of my abdominal wall. I did everything that was in your and my power. I now have to accept that I am the way that I am. Luckily, I am still alive!!! Patient B—1, Normal. 2, Fat and ugly! Thick trunk + face. Weak muscles. 3, Reasonable in proportion, but I could always be thinner. Patient C—1, Slender and upbeat. I could do everything, swimming, *etc.* 2, Moon face. Roll of fat on back, thick trunk, no neck. Thin arms and legs. Weird "convex" nails. 3, Slender with "apple" abdomen. I feel really sorry for myself. Patient D—1, Young, slender, beautiful hair, clear skin. I tanned nicely in the sun. Strong nails, good distribution of fat and muscles. 2, Moon face, acne, hirsutism. Buffalo hump, fat abdomen, thin arms and legs, fat and muscles not nicely distributed. Striae on my legs, calves, and armpits. Sweating. 3, Old skin with spots/does not tan anymore. Striae on legs, hips, armpits. No armpit hair, little pubic hair. Hair is less thick. Fragile nails. Fat and muscles not nicely distributed. Heavy abdomen, thin arms and legs. Patient E—1, It is lovely to be able to do everything. Work, family, holidays. 2, Fright, trembling legs. What to do! 3, Although Cushing's disease will always be present, I do not feel disabled due to expert treatment. Patient F—1, 1966, 19 yr old. Fifty-five kg. Normally proportioned. Upbeat. 2, 1969, 22 yr old. Blown-up face. Buffalo hump. Facial hair. Eighty-five kg. 3, 2010, 63 yr old. Seventy-four kg. Light hair growth on chin. Double chin.

Symptoms and ratings (Table 3)

The most common symptoms of Cushing's syndrome were scored in drawing 2 (active disease state) and drawing 3 (current state). Almost every patient drew fat accumulation (98%) in drawing 2, with moon face (87%) and increased trunk fat (87%). Twenty-seven percent of the patients drew skin lesions (*i.e.* bruises, red cheeks, acne, or striae), and 37% drew hirsutism or changes in hair. Fifty-nine percent of the patients showed some kind of emotion (*i.e.* positive or negative) in drawing 2, with 30% of the patients drawing a negative emotion and 70% of the patients drawing a positive emotion.

In drawing 3, 60% of the patients drew fat accumulation with moon face (29%) and increased trunk fat (36%). Two percent of the patients drew skin lesions, and 19% drew hirsutism or changes in hair. Fifty-six percent of the patients showed some kind of emotion in drawing 3, with only 4% of the patients drawing a negative emotion and 96% drawing a positive emotion.

TABLE 3. Symptoms and severity ratings

	Drawing 2	Drawing 3
Fat accumulation in general (%)	97.8	59.5
Fat accumulation, moon facies (%)	87.0	28.6
Fat accumulation, truncal fat (%)	87.0	35.7
Skin lesions (%)	27.2	2.4
Hirsutism/changes in hair (%)	37.0	19.0
Emotion in general (%)	58.7	56.0
Emotion, negative (%)	30.1	4.4
Emotion, positive (%)	69.9	95.6
Severity rating (range 1–5)	3.4 (1)	2.1 (1)

Data are expressed as mean (SD) unless mentioned otherwise.

Association between drawings and illness perceptions (Table 4)

The scores on the IPQ-R are listed in Table 4. There was a negative association between the width of the abdomen in drawing 3 (current state) and personal control (R =

TABLE 4. Scores on the IPQ-R

	Patients in remission of Cushing's syndrome (n = 47)
Illness identity	3.7 (3)
Timeline (acute/chronic)	23.3 (6)
Timeline (cyclical)	11.6 (4)
Consequences	20.2 (5)
Emotional representations	15.1 (5)
Personal control	17.3 (6)
Treatment control	16.9 (5)
Illness coherence	17.2 (3)

Data are expressed as mean (SD).

-0.362; $P = 0.033$). This means that a wider abdomen was associated with less perceived personal control. In addition, there was a positive association between the width of drawing 3 and the perceived consequences (R = 0.440; $P = 0.008$). This indicates that a wider drawing was associated with more perceived negative consequences. There were no associations between change from drawing 3 to drawing 2 and illness perceptions.

Association between drawings and QoL (Table 5)

The scores on the different QoL questionnaires are provided in Table 5. There were no associations between drawing 3 (current state) and the outcomes of the QoL questionnaires. There was, however, a negative association between the change in width between drawing 3 and drawing 2 and the subscale mental health of the SF-36 (R = -0.386; $P = 0.024$). This indicates that a larger reduction in the width of drawing 2 *vs.* drawing 3 is associated with a better score on mental health.

TABLE 5. Scores on the various QoL questionnaires

	Patients in remission of Cushing's syndrome (n = 47)
SF-36	
Physical functioning	63.5 (28)
Social functioning	72.1 (27)
Role limitation (physical)	51.3 (45)
Role limitation (emotional)	62.7 (41)
Mental health	61.4 (9)
Vitality	48.6 (9)
Pain	69.6 (25)
General health perception	50.1 (27)
General perception of change in health	50.6 (22)
EQ-5D	
Mobility	1.4 (1)
Self-care	1.0 (0)
Activity	1.6 (1)
Pain	1.7 (1)
Anxiety	1.3 (0)
VAS	67.5 (18)
Cushing QoL	
Total score	52.6 (19)

Data are expressed as mean (SD).

Association between drawings and the CSI

There was a positive association between the abdominal width in drawing 3 (current state) and the current CSI score (R = 0.410; $P = 0.013$), with a wider abdominal width being associated with a higher CSI score. Furthermore, there was an association between drawn accumulated abdominal fat in the second drawing (active disease state) and the CSI score in the active phase ($\chi^2 = 38$; $P = 0.033$) and an association between drawn accumulated abdominal fat in the second drawing (active disease state) and the CSI fat distribution score in the active phase ($\chi^2 = 25$; $P < 0.001$). There was also an association between overall fat accumulation in drawing 3 (current state) and the CSI fat distribution score ($\chi^2 = 17$; $P = 0.002$), and between drawn accumulated fat in the abdomen in the third drawing and the CSI fat distribution score ($\chi^2 = 8$; $P = 0.016$).

Association between drawings and perceived disease severity judged by doctors

Abdominal width in drawing 2 (active disease state) correlated positively with the disease severity judged by doctors (R = 0.438; $P = 0.004$). This indicates that a wider abdominal width was associated with a higher severity score judged by doctors. The abdominal width depicted in the third drawing (current state) also correlated positively with the disease severity as judged by doctors (R = 0.545; $P = 0.001$). This means that a wider abdominal width in the third drawing was also associated with a higher severity score judged by doctors. In addition, change in severity judgment between drawings 3 and 2 was positively correlated with both change in width of the head (R = 0.509; $P = 0.005$) and change in width of the abdomen between these drawings (R = 0.618; $P < 0.001$). This indicated that a larger difference in head size and abdominal size between drawing 2 and drawing 3 was associated with a larger difference in severity score between drawing 2 and drawing 3 judged by doctors, *i.e.* a smaller head and a smaller abdominal width were both associated with a lower severity score judged by doctors.

Discussion

This cross-sectional explorative study demonstrates that assessment of drawings by patients reveals additional illness perceptions of patients with long-term remission of Cushing's syndrome. The drawings appear to reflect a new dimension of the psychological status of the patient because there were almost no associations between the char-

acteristics of the drawings and QoL or illness perception parameters. We speculate that drawings do not share simple common properties with QoL questionnaires or illness perceptions directly and, consequently, may reflect different subjective concepts of long-term remission of Cushing's syndrome. However, earlier studies did find associations between drawings and QoL and illness perceptions (8–11, 14). We postulate that the difference in design between our study and other studies might play a role in explaining our findings regarding the drawings. In our study, the drawings were made with our patients being in long-term remission. In most other studies that involve illness drawings, patients produced the drawings when in the active state of their diseases. The course of illness perceptions is influenced by the disease. It might therefore be interesting to study drawings and the association with QoL and illness perceptions in patients with active Cushing's syndrome in the future.

Contrary to QoL and illness perceptions, there were clear associations between the patients' drawings and the Cushing's syndrome severity index. Wider drawings in general and larger abdominal widths were both associated with a poorer CSI score. Apparently, these characteristics of the drawings represent the clinical severity of the disease because there were clear associations between the CSI scores and the characteristics of the drawings. Furthermore, a wider abdominal width in the second (active disease state) and third (current state) drawing was associated with a higher severity rating by the doctors. In addition, a larger difference in both head size and abdominal size was associated with a higher severity score judged by doctors. Accordingly, a similar result was found by Reynolds *et al.* (9), who reported that the drawings of patients with heart failure showed a significant association with clinical markers of illness severity.

In addition, there were clear differences in the size of the various drawings: drawing 1 (healthy state before disease) was significantly smaller than the second (active disease state) and third drawings (current state after disease). In addition, the third drawing was significantly smaller than the second drawing. These results are consistent with earlier work that showed that the size of the drawing increases as the saliency of the object to the individual increases (8, 29). The findings indicate that patients perceive a change in body size before and during disease, and do not completely return to the body size before disease after treatment. Interestingly, the same pattern is observed in parameters of QoL, psychopathology, and cognition in patients with long-term cure of Cushing's syndrome (3–5).

Multiple common symptoms were drawn in the drawings of the active disease state: fat accumulation, moon face, trunk fat, skin lesions, and hirsutism. The same symptoms were observed in the third drawing reflecting the state at the moment of the current study, although to a much lesser extent. Although there were no large differences in the number of drawings that showed some kind of emotion, there was a clear pattern in the type of emotion: there was a large increase in the number of drawings that showed a positive emotion and a large decrease in the number of drawings that showed a negative emotion when the second and third drawings were compared.

Based on the findings, we postulate that it might be useful to add a drawing test to currently existing disease-specific QoL questionnaires, like the Cushing QoL (26). Drawings will add more information about the illness perceptions of the patient and can be used as a starting point in providing patients with information, which is helpful in the context of encouraging self-management and patient empowerment. Another important implication of this explorative study is that the drawing test will give the patient the opportunity to discuss his/her perception with a physician in an easy and low-cost manner. This may be very helpful in the clinical encounter because these drawings apparently unveil (mis-)conceptions, which do not become evident otherwise and which may hamper such factors as adherence and adjustments in lifestyle. A recent review by Sonino *et al.* (30) already postulated that it is time to take steps and translate research evidence into clinical practice initiatives to provide medical doctors with the necessary tools to better understand the psychosocial needs of their patients. In our opinion, the drawing test is an excellent first step in this process.

A possible limitation of this study is its explorative nature. Therefore, the results should be interpreted with caution, until other studies confirm our findings. However, this pilot study does show promise with regard to the use of the drawing test in everyday practice. Another possible limitation might be the fact that no Bonferroni correction was applied; when such a correction was used, there would be almost no effects in the primary endpoints undertaken in this study. The data were reported without adjustments for multiple comparisons. Simply defined, these adjustments test for no effects in all the primary end points undertaken *vs.* an effect in one or more of those endpoints. This is a difficult methodological issue because there are divergent views on the need for statistical adjustment for multiplicity. This is also reflected in the Lancet papers by Schulz and Grimes (31, 32), who advocate a restrictive approach toward adjustments for multiple comparisons. An important matter to keep in mind is the fact that the current pilot study is explorative. In our opinion, our data should not be neglected merely because of the absence of adjustments for multiple comparisons. Moreover, this would carry the serious risk of missing an im-

portant association between drawings and QoL, illness perceptions, or severity ratings.

The fact that the current cross-sectional study does not have a prospective design cannot be viewed as a limitation. We were interested in the retrospective and current perception of the patients, regardless of bias in memory retrieval. The drawings represent the self-perceptions of the patients before, during, and after cure of Cushing's syndrome. The third drawing represents the current state, and the first and second drawings were used to see whether patients believe their body has changed over time and—most importantly—to assess whether patients believe their body has changed due to Cushing's syndrome. We were interested in the perception of the patient at one time point (after long-term remission), and the retrospective drawings reflect their current perception. Future studies in larger cohorts might explore the possible association between fatigue or depression and the characteristics of the drawings.

We fully understand that it may seem strange or even "unscientific" to treat patient perceptions as facts. However, in real (medical) life, patients respond to an illness, its symptoms, and its treatments by creating an image of the illness and its treatment. This image usually differs from the image the medical professional sketches. Although we acknowledge that medical professionals may respond with amazement when researchers ask patients to report their cognitive and emotional representations of an illness, and accepting their reports at face value, theoretical and empirical work justifies examining these representations. Illness representations drive coping, self-management, and, therefore, outcome (33).

In summary, drawings are an interesting, low-cost, and relatively easy way to assess illness perceptions in patients with long-term remission of Cushing's syndrome. The assessments of the drawings reflect new dimensions of the psychological status of the patient. The characteristics of the drawings were associated with the Cushing's syndrome severity index and the severity ratings of health professionals. Furthermore, the assessments of the drawings indicate that patients perceived a change in body size during the active state, and to a lesser extent after cure, of Cushing's syndrome compared with the premorbid, healthy state. We postulate that drawings will enable health professionals to better understand the perception of the patient concerning the effects of long-term remission of Cushing's syndrome and will lead the way in dispelling idiosyncratic beliefs. This in turn may help self-management and patient empowerment.

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