Research and clinical assessment of eating and exercise behaviour

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The Eating and Exercise Examination (EEE-C) is an efficient, self-report, computer-generated and computer-reported examination of eating and exercise behaviour, attitudes and feelings. It is clinically useful for assessment of eating and exercise disorders, as a therapeutic tool to provide feedback to patients and as an instrument to provide standardized data for cost effective and relapse prevention studies.

Assessment of eating and exercise behaviour, eating and exercise attitudes and feelings about body image is difficult. What is normal can vary with fashion, between cultures and depend on variables such as age and choice of career. Additional factors complicate the assessment of eating disorders (Abraham and Llewellyn-Jones, 1997). Assessment must be able to detect people who are unaware of their disordered eating. The presence of an eating disorder may only become apparent when a person discovers they are unable to change their eating behaviour to maintain good health (Abraham et al, 1990) or the health of their baby (Conti et al, 1998).

Assessment must also assess people who do not feel that their disordered eating behaviour or weight loss is related to their body image. People change body weight for a number of reasons, not only because of a desire to change their body image. Common reasons for weight loss are to be fit and healthy and to feel better psychologically. Assessment must also allow for changing patterns of symptoms.

Eating disorders can become chronic conditions. During the course of their illness symptoms may change so a person successfully maintaining a very low body weight over many years may no longer have a fear of weight gain or a desire to lose weight and may wish to increase their weight for health reasons. These variables, that influence assessment of a person's disordered eating, have been considered during the development of the Eating and Exercise Examination (EEE-C) (Abraham and Lovell, 1999).

The EEE-C cannot detect a patient who is unwilling to disclose information about themselves but inconsistencies can be seen in the reports that can alert the clinician to possible problems.

This computer program, the EEE-C, provides an efficient assessment of eating and exercise behaviour, attitudes and feelings. It takes 20–45 minutes for a person to complete the examination and for the report to be generated. The computer does not generate redundant questions that can be time consuming and annoying to people who complete other assessment tools. Patients comment that it is easier to be truthful with the computer as 'the computer is not judgmental' about their behaviour. The EEE-C is suitable for people as young as 12 years and possibly younger. It has not yet been used with people less than 12 years of age. In this version of the EEE-C the body mass index (BMI) calculations are not meaningful for prepubertal males and females (O'Dea and Abraham, 1995). The EEE-C is suitable for people who can read simple English.

This paper describes the use of the EEE-C in clinical environments. The data presented are provided by the clinical report of the EEE-C in response to the information given by patients. The data have been taken from consecutive women being treated, both in hospital and as outpatients, for eating disorders requiring weight gain.

THE CLINICAL REPORT

The clinical report can be printed out immediately after the person completes the examination. This report can accompany the clinician's letter to the referring doctor. An examiner's report is also produced but will not be described in this paper*. The examiner's report provides additional information to help the clinician interpret the results given in the clinical report.

* This can be found at http://www.eng.unsw.edu.au/eee-c/

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Background information
This information gives the age, date of birth, sex, marital status and parity of the person. The anthropomorphic measures given are height, body weight, current BMI, lowest BMI (and age) and highest BMI (and age) (Llewellyn-Jones and Abraham, 1984). The units of height and weight used can be selected before the examination has begun. The computer generates the BMI values from the measures of height and weight. The menstrual status (for women), the meal status (number of meals) and physical activity (e.g. limited because of illness) are also given.

The person's current medical conditions, current medications being taken and their current psychiatric diagnoses are given by the person completing the examination and reported unchanged. Corrections to the patient's spelling mistakes and other information can be made at a later time by the clinician.

Behavioural criteria fulfilled
The presence or absence of behaviours associated with eating and exercise and the eating disorders are reported. The presence or absence of these criteria is derived from the information provided by the person completing the examination. The behavioural criteria are given in the manual (Abraham and Lovell, 1999).

The behaviours are for objective and subjective binges, objective and subjective binge eating, excessive exercise and excessive exercising and purging. The major difference between binge and binge eating is the frequency of the behaviour and not the amount eaten. The major difference between excessive exercise and excessive exercising is the frequency and not the intensity or duration of the behaviour.

Diagnostic criteria fulfilled
The diagnostic criteria a person may fulfil are listed in order of importance so an individual person will only receive one eating disorder diagnosis on the clinical report. A person may have both an eating disorder and an exercise disorder. The order of the eating disorder diagnoses is:

- Anorexia nervosa
- Anorexia nervosa not for weight or shape
- Bulimia nervosa
- Eating disorder — binge eating disorder
- Eating disorder — not otherwise specified.

Other diagnoses, and the subtypes of eating disorder — not otherwise specified, are available but not on the clinical report. These subdiagnoses may need additional interpretation by a clinician and these criteria may not be universally accepted. The criteria are given for the previous 3 months and 1 month.

Examination scores
There are 8 examination scores. Each score is derived from 5 subscores that are scored on a scale from 0 to 4. Each examination score therefore can range from 0 to 20. The examination scores are:

- Undereating behaviour
- Eating behaviour for weight and shape
- Overeating behaviour
- Eating attitudes
- Exercise attitudes
- Weight feelings
- Shape feelings
- Psychological feelings.

There is also a total average EEE score derived from 7 of the scores (only one score from undereating or eating behaviour for weight or shape is used in the total score). Eight examination scores were taken from 6 factors that were derived from factor analysis of 400 subjects. Undereating behaviour and eating behaviour for weight and shape were both derived from one of the 6 factors, and shape feelings and weight feelings were also both derived from another factor.

There is a body appearance self-rating (0 to 10) and the person's desired BMI is given.

AS AN ADJUNCT TO THE INITIAL ASSESSMENT OF PATIENTS

The clinical report can be used as an adjunct to assessment of patients and the planning of management for each patient. The clinical report can collect routine eating disorder assessment data and provide more time for the clinician to assess other aspects of the patient's presentation. Patients report that they are more truthful about their behaviours with the computer, particularly purging behaviour. The EEE-C diagnosis may differ from the diagnosis given to the patient before referral for assessment. This alerts the assessing clinician to the possibility of other medical and psychiatric problems and diagnoses.

Differences between the diagnoses in the previous month and 3 months can also alert the clinician to changes in living environments and life events. Behaviours the patient does not consider to be related to body image are incorporated into the EEE-C programme. The presence of these behaviours can be discussed with the patient. A desire for fitness and health, and to improve psychological health may lead to weight loss.

The behavioural criteria, the examination scores and the body appearance rating can be used to plan initial management for an individual patient. The normal ranges for female patients aged 16–25 years with an EEE-C diagnosis of anorexia nervosa, bulimia nervosa, an eating disorder — not otherwise specified and students with no eating disorder are given in *Table 1* and the descriptive details of these women in *Table 2*. Normal ranges are given for a greater variety of groups in the manual (Abraham and Lovell, 1999).

Patients receiving an EEE-C diagnosis of anorexia nervosa not for weight or shape differ significantly from women diagnosed as having anorexia nervosa in three examination scores; eating behaviour for weight and shape, weight feelings and shape feelings (Abraham and Lovell, 1999).

FOR USE DURING TREATMENT

We are examining the usefulness of regular completion of the EEE-C accompanied by discussion of the results with patients during treatment. The changes in some of the EEE-C monthly measures and the diagnoses of three patients during inpatient treatment of anorexia nervosa are shown in *Table 3*. This is the first time these patients had been treated for their eating disorder.

Patients like the feedback, even if it only confirms what they already think about their progress. They like their progress to be monitored and to be acknowledged by health professionals. On occasions the failure of some of their results to improve can help the patient to gain insight into their problem and for the clinician to modify treatment to help with the problem. An example of this is the positive response of a patient to seeing that they are subjectively and not objectively binge eating. These patients appear to accept that subjective binges will not lead to rapid weight gain and that their feeling of binge eating may result from undereating at other times.

The 3 patients whose data are shown in *Table 3* are all experiencing their first admission to hospital for weight gain and treatment of their eating disorder. Before EEE-C assessment all patients had been diagnosed as having anorexia nervosa and patients 1 and 2 were also considered to be depressed. All remained in hospital for 2 months before discharge.

TABLE 1.
Mean examination scores for women with anorexia nervosa (An), bulimia nervosa (Bn), non-specific eating disorder (ednos) and no eating disorder

	An (n = 30)		Bn (n = 30)		ednos (n = 60)		None (n = 100)	
Behaviour	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Undereating behaviour	14.7	4.1	13.7	4.1	8.3	5.3	4.7	4.1
Eating behaviour for weight and shape	13.9	4.8	13.5	4.3	7.8	5.6	4.1	4.2
Overeating behaviour	4.3	4.4	12.4	3.6	5.9	4.7	2.5	2.8
Eating attitudes	13.3	3.5	14.2	4.8	7.1	5.1	2.8	3.3
Exercise attitudes	14.0	5.4	10.3	5.7	7.7	5.0	6.0	5.2
Weight feelings	14.2	4.7	15.7	2.8	10.2	5.8	6.2	5.2
Shape feelings	16.2	4.1	18.0	1.9	11.7	5.9	8.2	5.5
Psychological feelings	13.9	4.4	14.0	4.5	7.9	5.5	3.9	4.0
Total average score	13.7	2.8	14.1	2.6	8.4	3.9	4.9	3.3

TABLE 2.
Body appearance rating, BMI, desired BMI and age of women with anorexia nervosa (An), bulimia nervosa (Bn), non-specific eating disorder (ednos) and no eating disorder

	An (n = 30)		Bn (n = 30)		ednos (n = 60)		None (n = 100)	
Characteristic	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Body appearance	3.4	2.6	4.0	2.2	4.9	2.3	6.0	1.6
Desired body mass index (BMI)	15.7	2.1	18.9	1.5	18.4	2.0	19.8	1.8
Actual BMI	15.5	1.4	21.4	2.0	19.3	3.0	21.2	2.9
Age	19.7	3.0	20.3	3.0	19.1	3.0	19.5	2.6

TABLE 3.
The monthly Eating and Exercise Examination (EEE-C) diagnoses and examination scores for 3 patients diagnosed with an eating disorder requiring treatment in an eating disorder unit

Patient	Time	Diagnosis previous month	Diagnosis previous 3 months	BMI	Desired BMI	EEE Examination Scores#								
						UB	OE	EA	EX	WF	SF	PSY	TOT	BA
1*	base	an	annws	15.0	15.9	13	6	11	20	5	12	5	10	3
	month 1	ednos		17.1	16.3	1	0	5	0	1	5	5	2	5
	month 2	nil		19.5	16.3	0	1	1	1	5	9	5	3	4
2†	base	annws	ednos	17.0	15.4	13	0	13	12	15	12	8	10	2
	month 1	an		17.3	15.4	14	0	10	11	18	18	9	11	1
	month 2	nil		18.1	17.4	6	0	2	2	7	6	3	4	3
3‡	base	an	an	13.2	17.0	17	1	14	19	17	10	16	13	2
	month 1	ednos		15.5	18.0	5	2	7	10	7	4	14	7	5
	month 2	ednos		17.1	18.4	5	1	4	7	4	5	7	5	6

*13 years, menstrual status irregular (one menstrual bleed in last 3 months); †18 years, oral contraception; ‡16 years, secondary amenorrhoea. # UB =undereating behaviour, OB = overeating behaviour, EA = eating attitudes, EX = exercise attitudes, WF = weight feelings, SF = shape feelings, PSY = psychological feelings, TOT = total average, BA = body appearance rating. an = anorexia nervosa, annws = anorexia not for weight or shape, ednos = eating disorder not otherwise specified.

Patient 1 appeared to respond to treatment very quickly, there were no changes in psychological examination scores and there was an increase in body image worries before discharge from hospital.

Patient 2, after the first month of treatment, gained insight into her behaviour and accepted she had an eating disorder, the initial diagnosis of anorexia nervosa not for weight and shape surprised her and helped her to accept that she had an eating disorder. After the first month, she acknowledged she was being more truthful with herself and staff. Her modest weight gain in the first month reflects her use of excessive exercise and food restriction. After 2 months and immediately before discharge from hospital patient 2 confirmed that her psychological status had improved and she no longer experienced the depressive moods and feelings of hopelessness. She had ceased antidepressant medication when she came into hospital.

The eating disorder of Patient 3 responded quickly to treatment but there was no change in her psychological status. Feelings of being confused about what she thought and feelings of depression were the major aspects of her psychological examination score. Discussion of these findings resulted in tears and sobbing and she stated that nothing had really changed and that she felt just as bad as before she came into hospital. Greater opportunity was made for her to be involved in individual therapy and discussion about herself, her family and their problems, and antidepressant mediation was commenced. Although the antidepressant action of her medication would not have commenced at the time of her next assessment, her overall psychological status improvement and this was reflected in her EEE results, despite her pending discharge back to a difficult family situation.

AS AN INSTRUMENT TO ASSESS THE OUTCOME OF TREATMENT

Hospitals and clinics need to show that their treatment is cost effective. We are assessing people 12 months after they are discharged from their first treatment in hospital for an eating disorder requiring weight gain. The results of 3 patients on admission to hospital and 12 months after discharge are shown in *Table 4*.

The outcome of these last 3 patients to be assessed is different. This 12-month outcome study has provided patient 3 with intervention for her current problem. It is anticipated that this study will prove to be cost effective for health funds.

DISCUSSION

The EEE-C can be used in hospital clinics for the assessment and treatment of eating and exercise disorders. It can be used to measure changes to treatment and the effectiveness of relapse prevention strategies. To allow for different treatment options the EEE-C provides a number of different measures of outcome ranging from the person's behaviour to their psychological feelings. The strict criteria for the EEE-C diagnosis of an eating disorder ensures the diagnosis at the beginning of a study was current (and not simply one made at some time in the past).

The use of the EEE-C for initial diagnosis also ensures researchers or assessors do not vary in their application or interpretation of eating disor-

der behaviour when they formulate a patient diagnosis, and means that studies using the EEE-C for entry into a study will be able to be compared with other similar studies.

It is expected that the use of the EEE-C in clinical practice will alert clinicians to possible problems, such as the presence of new behaviours, and allow appropriate intervention to be offered to patients. Only a few patients develop a chronic eating disorder. Whether EEE-C monitoring will prevent this chronic form of anorexia nervosa is yet to be determined.

The EEE-C offers some advantages over the currently available and well validated assessment tools for eating behaviour (Fairburn and Cooper, 1993; Garner and Garfinkel, 1979, 1983). The EEE-C provides immediately available processed data, the time spent by health professionals in routine assessment of eating disorder patients is reduced, redundant questions are not asked, behaviour for reasons other than body image is included and the diagnoses for eating and exercise disorders are available for the previous month, in additions to the traditional 3 months, for short-term studies. HM

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TABLE 4.
Eating and Exercise Examination (EEE-C) data that may be used to assess outcome of treatment of patients

Patient	Measure	Before treatment	After 1 year	Comments
4	Diagnosis	annws	annws	Readmitted to hospital
	BMI	15.3	15.3	Same on both admissions
	Menstrual status	Amenorrhoea	Amenorrhoea	
	Desired BMI	17.9	17.3	
	BA	4	5	
	Total EEE score	12	10	
Patient 4 is a 15-year-old student who lost the body weight she gained during her first admission and was readmitted after 12 months at a BMI identical to her first admission. There were no changes in her behaviour or weight. Her eating patterns were improved but she continued to restrict the amount eaten. She continues to deny she has a problem. Her prognosis remains poor				
5	Diagnosis	an	nil	
	BMI	15.7	21.6	
	Menstrual status	Amenorrhoea	Regular	
	Desired BMI	18.9	20.1	
	BA	5	5	
	Total EEE score	15	4	
	Psychological score		12	4
Patient 5 is a 31-year-old married woman who responded well to treatment for her eating disorder and depressive symptoms. After discharge from hospital she continued to eat well and allow her body weight to increase. Following discussion with her psychiatrist she has recently ceased regular outpatient treatment. Her progress is excellent				
6	Diagnosis	annws	nil	
	BMI	15.6	21.8	Commenced binge eating
	Menstrual status	Amenorrhoea	Regular	
	Desired BMI	17.6	19.9	
	BA	5	4	
	Total EEE score	13	12	
	Psychological score		14	12
	Overeating score	3	16	Objective binge eating
Patient 6 is an 18-year-old student who commenced binge eating for the first time after being discharged from hospital. She is currently experiencing objective binge eating but she does not have an EEE-C diagnosis of an eating disorder, although she has worries about her binge eating and the effect this may have on her body image. Intervention has commenced				

an = anorexia nervosa, annws = anorexia not for weight or shape, BA = body appearance, BMI = body mass index

KEY POINTS

- The Eating and Exercise Examination (EEE-C) computer program provides an efficient assessment of eating and exercise behaviour, attitudes and feelings.
- A clinical report is available and can be printed out as soon as the person completes the examination.
- The EEE-C can be used for the assessment of eating and exercise disorders of patients and clients in clinical practice, in conjunction with the clinician.
- Regular EEE-C assessment and feedback to patients can aid the therapeutic process.
- The EEE-C is a tool for measurement of the outcome of treatment for eating disorders. It is suitable for cost effective and relapse prevention studies.