

Workshop « Évaluation et analyse de la qualité de vie » 3 et 4 avril 2014 CGSO

The Caregivers Quality of Life Cancer
index scale (CQoLC): An Exploratory
Factor Analysis for validation in French
cancer patients' spouses



Prof. Florence Cousson-Gélie

Epidaure, Pôle Prévention de l'ICM

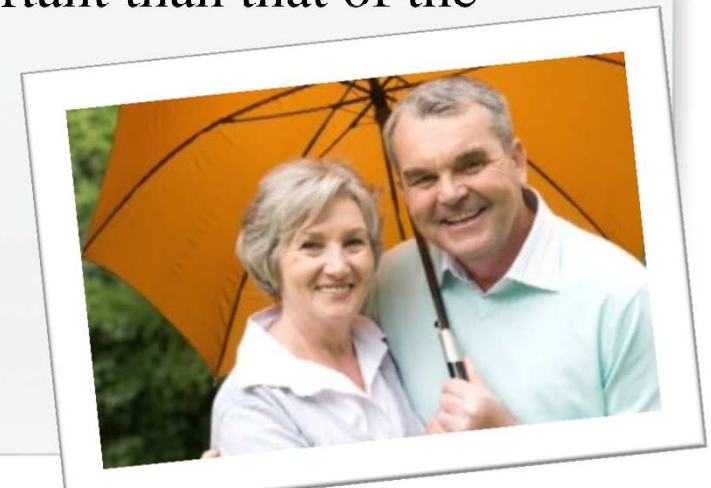
Directrice Scientifique

Université Montpellier 3, Laboratoire Epsilon



Institut régional du Cancer
Montpellier | Val d'Aurelle

- Cancer causes major disruption to both the patient and his/her spouse and produces a new set of challenges for both (Sabo, 1990 ; Lewis, 1990, Hodges et al., 2005).
- It is well known that cancer experience increases anxiety and depression, decreases physical health and limits daily activity and marital relationships , in patient and spouse (Northouse, 2001 ; Manne et al., 2005; Glasdam et al, 1996).
- The distress of spouses, in relation to the illness, affects their QoL (Weitzner et al., 1999) in ways often more important than that of the patient himself (Moser et al., 2013).



Development of the Caregivers Quality of Life Cancer index scale

- 3 phases :
 1. 22 matched patient-caregiver dyads and 10 health professionals were interviewed.
 2. A list of one 120 sentences was generated and, through reduction of redundancy items, a final list of 91 items was obtained by expertise. The 91 items was administered to another sample of 96 family caregivers and 70 patients. Items with a cumulative frequency of at least 60% were retained and formed the final questionnaire.
 3. A new set of 263 identified family caregivers were recruited to assess validity and reliability.
- The final version of the CQOLC contain 35 items

	0	1	2	3	4
1/ Ca me tracasse qu'il y ait des changements dans ma vie quotidienne	0	1	2	3	4
2/ Mon sommeil est moins reposant	0	1	2	3	4
3/ Ma vie quotidienne ne se fait qu'en fonction du cancer de mon mari	0	1	2	3	4
4/ Je suis satisfaite de ma vie sexuelle	0	1	2	3	4
5/ C'est un défi que de maintenir mes loisirs, activités extérieures	0	1	2	3	4
6/ J'ai des difficultés financières	0	1	2	3	4
7/ je suis préoccupée par notre couverture sociale / notre assurance maladie	0	1	2	3	4
8/ Mon futur économique est incertain	0	1	2	3	4
9/ Je crains que mon mari ne meurt	0	1	2	3	4
10/ J'ai des perspectives plus positives sur la vie depuis la maladie de mon mari	0	1	2	3	4
11/ Mon niveau de stress et d'inquiétude a augmenté	0	1	2	3	4
12/ Mon sens de la spiritualité a augmenté	0	1	2	3	4
13/ Ca me tracasse de limiter mon attention, mes intérêts au jour le jour	0	1	2	3	4
14/ Je me sens triste	0	1	2	3	4
15/ Je me sens surmenée	0	1	2	3	4
16/ J'obtiens le soutien de mes amis et voisins	0	1	2	3	4
17/ Je me sens coupable	0	1	2	3	4
18/ Je me sens frustrée	0	1	2	3	4
19/ Je me sens nerveuse	0	1	2	3	4
20/ Je suis inquiète de l'impact de la maladie de mon mari sur mes enfants et les autres membres de la famille	0	1	2	3	4
21/ J'ai des difficultés à gérer le changement des habitudes alimentaires de mon mari	0	1	2	3	4
22/ J'ai développé une relation plus intime avec mon mari	0	1	2	3	4
23/ Je me sens suffisamment informée à propos de la maladie de mon mari	0	1	2	3	4
24/ Ca me tracasse de devoir être le chauffeur de mon mari pour ses rendez-vous	0	1	2	3	4
25/ Je redoute les effets secondaires que le traitement de mon mari auront	0	1	2	3	4
26/ La responsabilité que j'ai de mon mari à la maison m'accable	0	1	2	3	4
27/ Je suis contente que mon attention se centre sur mon mari	0	1	2	3	4
28/ La communication familiale a augmenté	0	1	2	3	4
29/ Ca me tracasse que mes priorités aient changé	0	1	2	3	4
30/ Le besoin de protéger mon mari me tracasse	0	1	2	3	4
31/ Ca me bouleverse de voir l'état de mon mari s'aggraver	0	1	2	3	4
32/ Le besoin de gérer la douleur de mon mari me bouleverse	0	1	2	3	4
33/ Je suis découragée au sujet du futur	0	1	2	3	4
34/ Je suis satisfaite du soutien que m'apporte ma famille	0	1	2	3	4
35/ Ca me tracasse que les autres membres de ma famille n'aient montré aucun intérêt à prendre soin de mon mari	0	1	2	3	4

- The CQOLC measures four conceptual domains of QoL:
 1. Physical functioning
 2. Emotional functioning
 3. Family functioning
 4. Social functioning



- This scale was validated in a Korean population by Rhee et al. (2005) and in a Turkish population by Bektas et al. (2009) and Ozer et al. (2009).

1. Describe the psychometric properties of the French form of the CQOLC scale
 - ✓ Factor structure
 - ✓ Convergent and discriminant validity
2. Verify its usefulness to spouses' caregivers.

Participants

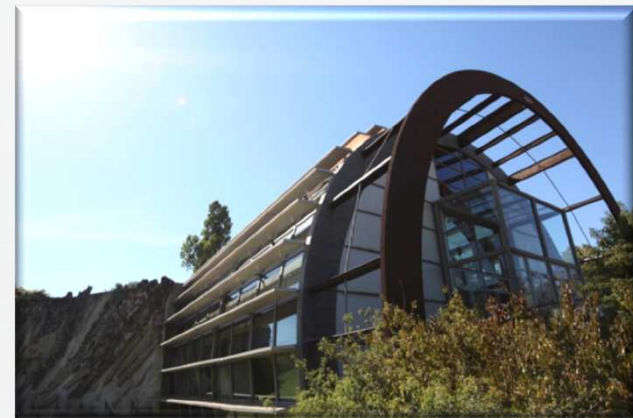
Variables	N (%)	Mean (SD)
Spouse's Age (years)		57.58 (12.42)
Number of children		1.97 (1.22)
Spouse's Gender		
Women	174 (58.0)	
Men	126 (42.0)	
Marital status		
Married	262 (87.3)	
Cohabitation	35 (11.7)	
Unknown	3 (1.0)	
Spouse's employment status		
Unemployed	17 (5.7)	
Employed part-time	33 (11.0)	
Employed full-time	116 (38.7)	
Retired	103 (34.3)	
Job search	15 (5.0)	
Other	16 (5.3)	
Spouse's Education		
Primary/Secondary	131 (43.7)	
High	82 (27.3)	
University	70 (23.4)	
Other	17(5.6)	
Type of patient cancer		
Breast	77 (25.7)	
Prostate	114 (38.0)	
Colorectal	23 (7.7)	
UADC	15 (5.0)	
Gynecology	22 (7.3)	
Others	45 (15.0)	
Unknown	4 (1.3)	
Type of treatments (n=288)		
Chemotherapy	122 (40.7)	
Radiotherapy	141 (47.0)	
Hormonotherapy	6 (2.0)	
Surgery	19 (6.3)	
Unknown	12 (4.0)	
Duration of illness (years)		2.05 (3.12)

- 356 spouses of cancer patients were contacted from oncology services in two French hospitals.
- Of these, 300 accepted to participate :
 - ✓ 174 women
 - ✓ 126 men
 - ✓ mean age 57.6 (SD 12.42)

Translation and adaptation procedure

- Consent from Weitzner to adapt the CQOLC for French assessment.
- We translated the English version of the CQOLC into French, according to the back-translation procedure.
- The preliminary French translation was back-translated into English by an independent pair, one of whom was a native English speaker.
- The pair compared the back-translated version with the original and pointed out any discrepancies.
- We repeated this procedure until agreement was obtained.
- We performed a pilot test on 30 spouses of cancer patients.

- CQOLC:
 - ✓ 35 items,
 - ✓ five-point Likert-type scale (0 'not at all' to 4 'very much'),
 - ✓ burden (10 items), disruptiveness (7 items), positive adaptation (7 items), and financial concerns (3 items)
- SF-12:
 - ✓ 12 items
 - ✓ Physical activity
 - ✓ Mental health
- STAI
 - ✓ 20 items
 - ✓ State anxiety



Factor analysis

“Perhaps the most widely used (and misused) multivariate [technique] is factor analysis. Few statisticians are neutral about this technique. Proponents feel that factor analysis is the greatest invention since the double bed, while its detractors feel it is a useless procedure that can be used to support nearly any desired interpretation of the data. **The truth, as is usually the case, lies somewhere in between.** Used properly, factor analysis can yield much useful information; when applied blindly, without regard for its limitations, it is about as useful and informative as Tarot cards. **In particular, factor analysis can be used to explore the data for patterns, confirm our hypotheses, or reduce the many variables to a more manageable number.**”

Norman & Streiner, *PDQ Statistics*

Exploratory Factor Analysis (EFA)

- Used to explore the dimensionality of a measurement instrument by finding the smallest number of interpretable factors needed to explain the correlations among a set of variables.
- Exploratory in the sense that it places no structure on the linear relationships between and the factors but only specifies the number of latent variables.

Classical test theory idea

$$X_1 = \lambda_1 F + e_1$$

$$X_2 = \lambda_2 F + e_2$$

...

$$X_m = \lambda_m F + e_m$$

(unequal “sensitivity” to change in factor)

$$\text{var}(e_j) \neq \text{var}(e_k), j \neq k$$

- F is latent (i.e. unobserved, underlying) variable
- X's are observed (i.e. manifest) variables
- e_j is measurement error for X_j .
- λ_j is the “loading” for X_j

What is a Factor Loading?

- A factor loading is the correlation between a variable and a factor that has been extracted from the data.

Example: Note the factor loadings for variable X1.

Variables	Factor I	Factor II	Factor III
X1	0.932	0,013	0,250

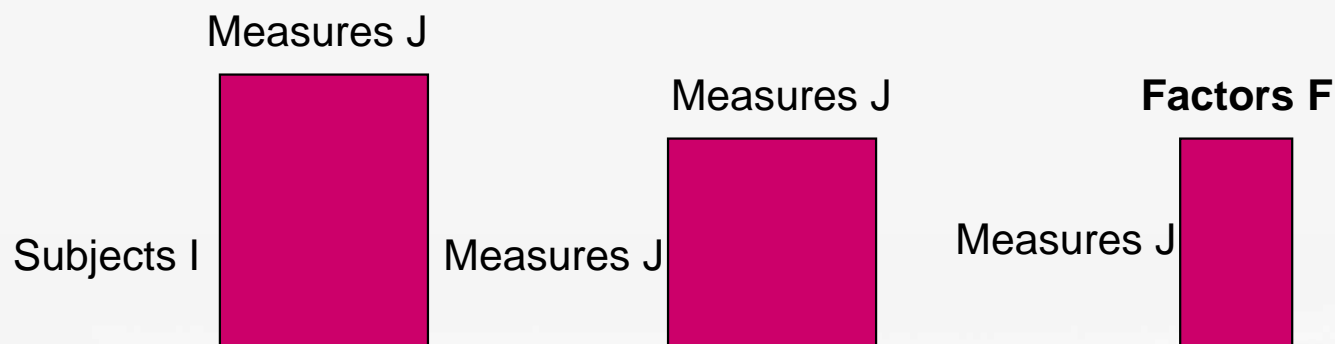
Interpretation

- Variable X1 is highly correlated with Factor I, but negligibly correlated with Factors II and III

- (1) Collect and explore data: choose relevant variables.
- (2) Extract initial factors
- (3) Choose number of factors to retain
- (4) Choose estimation method, estimate model
- (5) Rotate and interpret
- (6)
 - (a) Decide if changes need to be made (e.g. drop item(s), include item(s))
 - (b) repeat (4)-(5)
- (7) Construct scales and use in further analysis

- Histograms
 - ✓ normality
 - ✓ discreteness
 - ✓ Outliers
- Covariance and correlations between variables
 - ✓ very high or low correlations?
- Same scale
- high = good, low = bad?

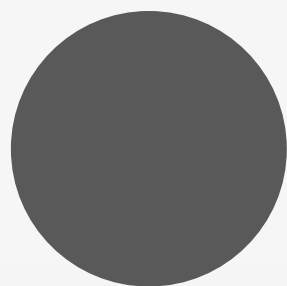
Observed variables → Correlation matrix → Loading matrix



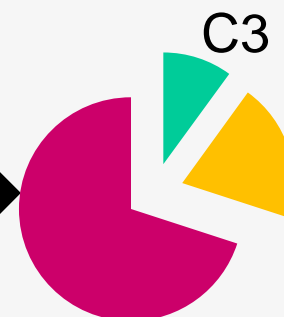
Reduce many variables

Principal component analyses

Initial variance

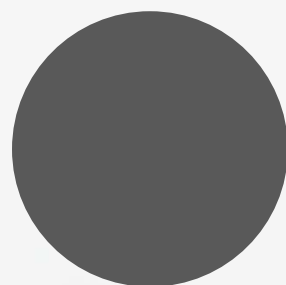


Unexplained variance



Component are independant

Initial variance



Unique variance



Common variance



Extraction
of
dimensions



Institut régional du Cancer
Montpellier | Val d'Aureille

Intercorrelation among the variables of CQoLC

Matrice de corrélation^a

		cq1	cq2	cq3	cq4	cq5	cq6	cq7	cq8	cq9	cq10	cq11	cq12	cq13	cq14	cq15	cq16	cq17	cq18	cq19
Corrélation	cq1	1,000	,551	,428	-,121	,479	,343	,292	,304	,375	,001	,538	,138	,594	,584	,450	,063	,361	,529	,546
	cq2	,551	1,000	,449	-,092	,433	,337	,113	,249	,352	,032	,543	,109	,538	,542	,499	,142	,314	,340	,604
	cq3	,428	,449	1,000	-,083	,496	,228	,269	,212	,416	,033	,485	,027	,455	,414	,294	,124	,167	,222	,292
	cq4	-,121	-,092	-,083	1,000	-,199	-,001	-,035	-,027	-,018	,131	-,062	-,036	-,188	-,096	-,097	-,126	-,035	-,235	-,125
	cq5	,479	,433	,496	-,199	1,000	,297	,208	,262	,395	,012	,484	,125	,454	,440	,359	,090	,232	,357	,370
	cq6	,343	,337	,228	-,001	,297	1,000	,352	,631	,280	,110	,303	,296	,431	,381	,363	-,032	,287	,244	,359
	cq7	,292	,113	,269	-,035	,208	,352	1,000	,485	,220	,174	,223	,095	,239	,148	,247	-,068	,134	,249	,175
	cq8	,304	,249	,212	-,027	,262	,631	,485	1,000	,340	,035	,273	,195	,361	,323	,351	-,021	,196	,239	,281
	cq9	,375	,352	,416	-,018	,395	,280	,220	,340	1,000	,062	,641	,145	,444	,468	,256	,037	,233	,331	,491
	cq10	,001	,032	,033	,131	,012	,110	,174	,035	,062	1,000	,067	,245	-,021	-,102	,049	-,043	-,005	-,047	,014
	cq11	,538	,543	,485	-,062	,484	,303	,223	,273	,641	,067	1,000	,130	,537	,665	,409	,146	,271	,457	,633
	cq12	,138	,109	,027	-,036	,125	,296	,095	,195	,145	,245	,130	1,000	,189	,153	,133	-,001	,161	,127	,170
	cq13	,594	,538	,455	-,188	,454	,431	,239	,361	,444	-,021	,537	,189	1,000	,590	,501	-,025	,295	,474	,553
	cq14	,584	,542	,414	-,096	,440	,381	,148	,323	,468	-,102	,665	,153	,590	1,000	,498	,012	,318	,518	,624
	cq15	,450	,499	,294	-,097	,359	,363	,247	,351	,256	,049	,409	,133	,501	,498	1,000	,054	,287	,450	,492
	cq16	,063	,142	,124	-,126	,090	-,032	-,068	-,021	,037	-,043	,146	-,001	-,025	,012	,054	1,000	-,078	,004	,080
	cq17	,361	,314	,167	-,035	,232	,287	,134	,196	,233	-,005	,271	,161	,295	,318	,287	-,078	1,000	,444	,296
	cq18	,529	,340	,222	-,235	,357	,244	,249	,239	,331	-,047	,457	,127	,474	,518	,450	,004	,444	1,000	,575
	cq19	,546	,604	,292	-,125	,370	,359	,175	,281	,491	,014	,633	,170	,553	,624	,492	,080	,296	,575	1,000
	cq20	,444	,337	,320	-,044	,362	,287	,090	,190	,424	,100	,493	,209	,437	,467	,302	,022	,267	,345	,357
	cq21	,364	,245	,241	-,192	,396	,194	,139	,270	,219	,084	,341	,167	,323	,366	,282	,066	,228	,232	,326
	cq22	,064	,084	,173	,163	,096	,074	,096	,121	,306	,251	,225	,290	,041	,149	,020	,080	,060	,065	,136
	cq23	-,087	-,162	,033	,139	-,040	-,072	-,099	-,069	-,117	-,026	-,154	,033	-,112	-,084	-,281	,139	-,142	-,194	-,147
	cq24	,303	,161	,113	-,083	,166	,217	,155	,299	,100	-,082	,124	,064	,281	,223	,197	-,001	,095	,218	,183
	cq25	,355	,269	,352	-,046	,286	,178	,188	,157	,394	,069	,517	,147	,309	,384	,238	,101	,157	,259	,372
	cq26	,393	,260	,265	-,037	,378	,277	,205	,229	,277	-,025	,270	,096	,466	,425	,301	-,144	,166	,294	,350
	cq27	,014	,100	,168	,237	,050	,082	,125	,102	,230	,112	,139	,083	,051	,061	,014	,102	-,076	-,056	,117

Factorability of an intercorrelation Matrix

- Q How much collinearity or common variance exists among the variables?
- Q Is the intercorrelation matrix "factorable"?

Two Tests

- Bartlett's Test of Sphericity
- Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)

	X ₁	X ₂	X ₃	X ₄	X ₅
X ₁	1.00	0.00	0.00	0.00	0.00
X ₂		1.00	0.00	0.00	0.00
X ₃			1.00	0.00	0.00
X ₄				1.00	0.00
X ₅					1.00

- The variables are totally noncollinear.
- If the matrix was factor analyzed ...
 - ✓ It would extract as many factor as variables, since each variable would be its own factor
 - ✓ It is totally non-factorable

Results of Bartlett's Test of Sphericity and KMO

Indice KMO et test de Bartlett

Mesure de précision de l'échantillonnage de Kaiser-Meyer-Olkin.		,891
Test de sphéricité de Bartlett	Khi-deux approximé	4053,389
	ddl	595
	Signification de Bartlett	,000

Test Results

$$\chi^2 = 4053.389$$

$$df = 595$$

$$p < 0.001$$

Statistical Decision

The sample intercorrelation matrix did not come from a population in which the intercorrelation matrix is an identity matrix.

Interpretation of the KMO

KMO Value	Degree of Common Variance
0.90 to 1.00	Marvelous
0.80 to 0.89	Meritorious
0.70 to 0.79	Middling
0.60 to 0.69	Mediocre
0.50 to 0.59	Miserable
0.00 to 0.49	Don't Factor

- $KMO = 0.891$
- The degree of common variance among the 35 variables is « meritorious »
- If a factor analysis is conducted, the factors extracted will account for fare amount of variance.

- A variety of methods have been developed to extract factors from an intercorrelation matrix. SPSS offers the following methods:
 - ✓ Principle components method
 - ✓ Maximum likelihood method (a commonly used method)
 - ✓ Principal axis method also known as common factor analysis
 - ✓ Unweighted least-squares method (useful with ordinal data)
 - ✓ Generalized least squares method
 - ✓ Alpha method
 - ✓ Image factoring

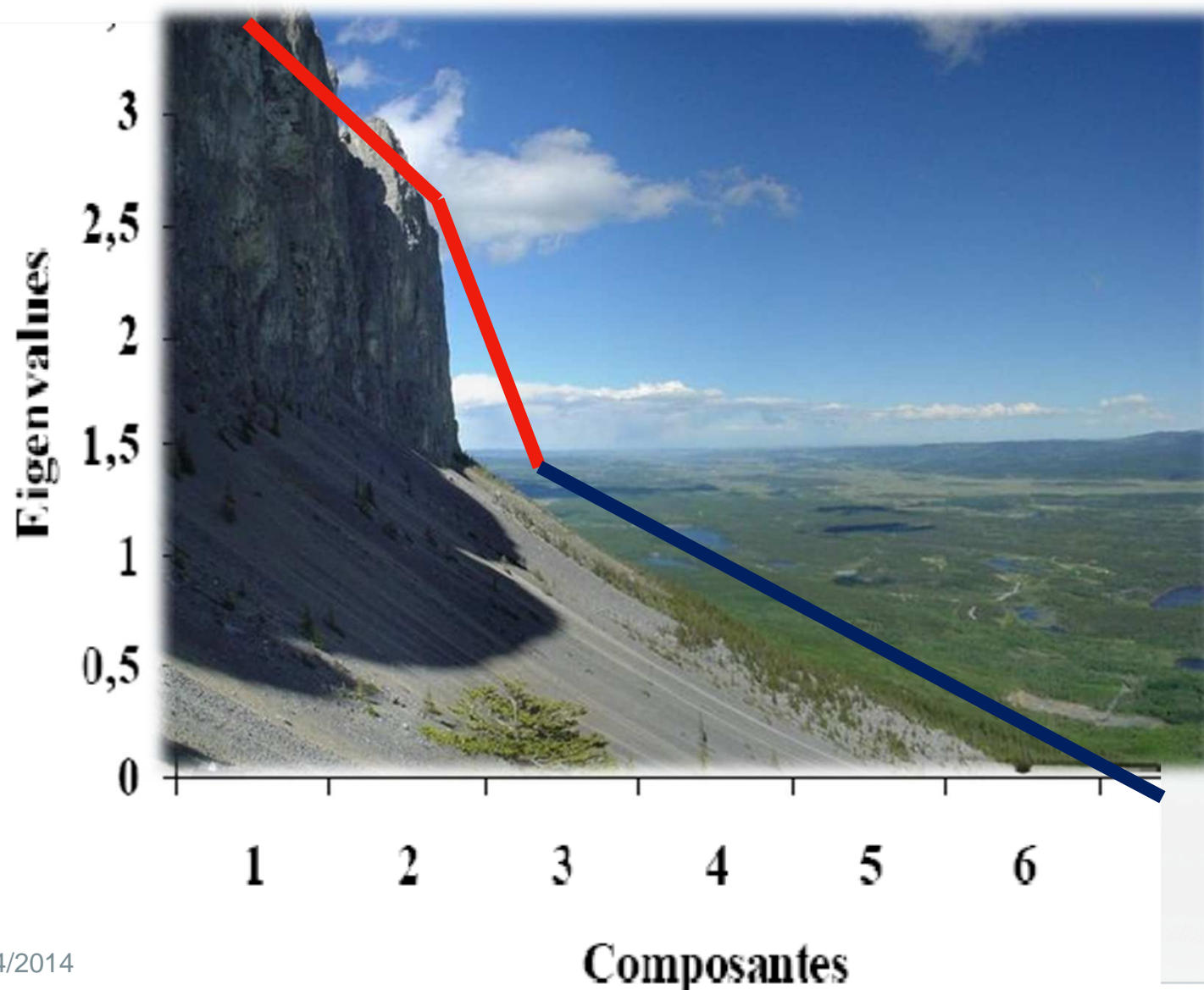
Results of the initial solution

Variance totale expliquée

- 35 factors were extracted,
- Factor I has an eigenvalue = 9.97. Since this is greater than 1.0, it explains more variance than a single variable, in fact 9.97 time as much.
- The % of variance explained $(9.97/35 \text{ unit of variance}) \times 100 = 28,50\%$
- 9 factors have eigenvalues more than 1.00

Facteur	Valeurs propres initiales			Extraction Sommes des carrés des facteurs retenus		
	Total	% de la variance	% cumulés	Total	% de la variance	% cumulés
1	9,977	28,506	28,506	9,484	27,097	27,097
2	2,663	7,607	36,113	1,390	3,970	31,067
3	2,037	5,820	41,933	2,039	5,825	36,892
4	1,596	4,561	46,494	1,278	3,652	40,544
5	1,325	3,786	50,280	,876	2,504	43,048
6	1,282	3,662	53,942	,818	2,338	45,386
7	1,105	3,156	57,098	,561	1,603	46,989
8	1,046	2,990	60,088	,617	1,762	48,751
9	1,021	2,917	63,005	,491	1,401	50,153
10	,993	2,836	65,841			
11	,945	2,701	68,542			
12	,839	2,398	70,940			
13	,808	2,309	73,249			
14	,747	2,134	75,384			
15	,730	2,085	77,468			
16	,643	1,838	79,306			
17	,606	1,730	81,036			
18	,591	1,690	82,726			
19	,539	1,540	84,266			
20	,509	1,453	85,719			

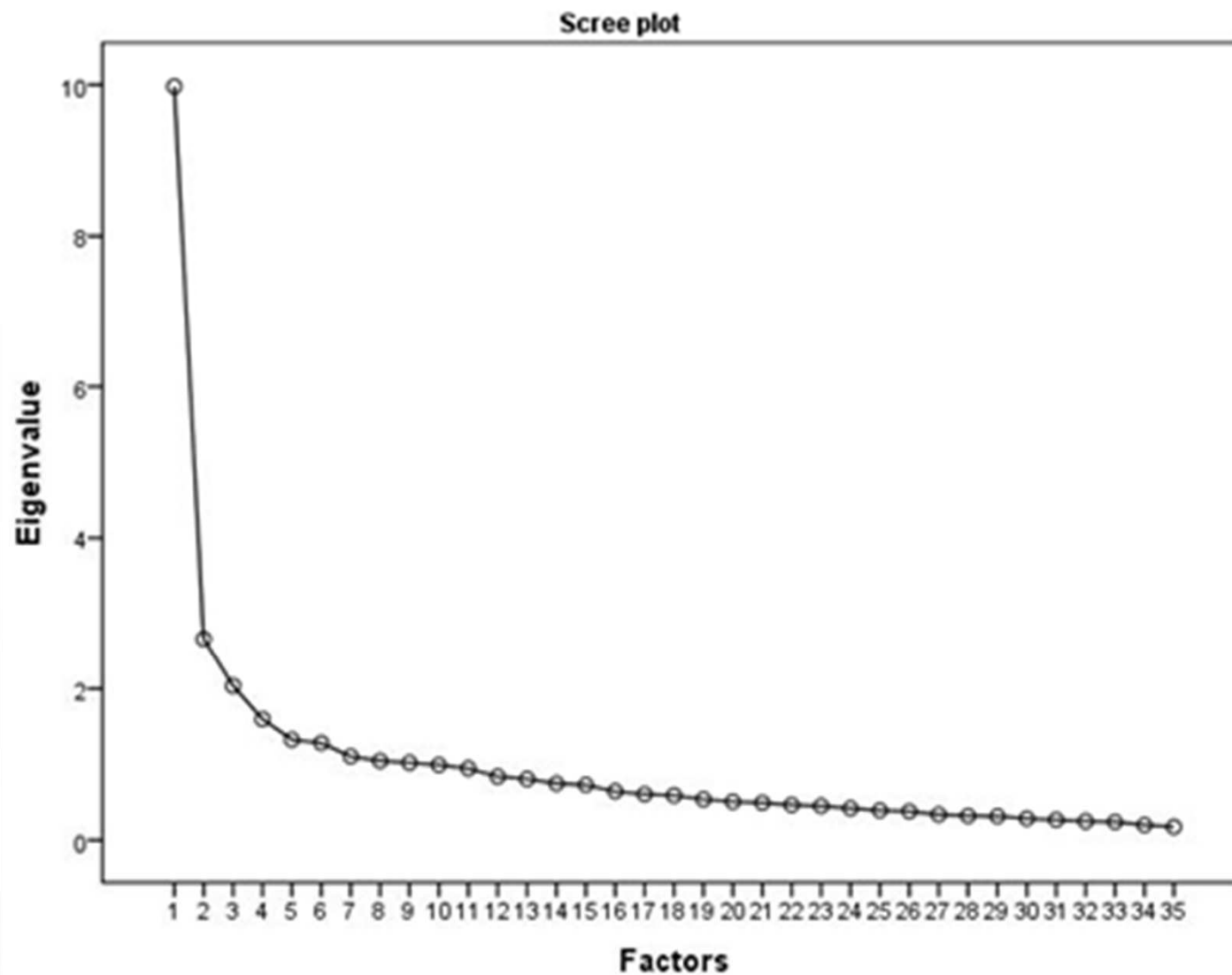
Principle of scree plot





Institut régional du Cancer
Montpellier | Val d'Aureille

Cattell's Scree Plot



Matrice factorielle^a

	Facteur			
	1	2	3	4
cq1	,737	-,157	,105	,077
cq2	,635	-,069	,142	,014
cq3	,564	,083	,161	-,037
cq4	-,155	,322	-,162	-,045
cq5	,620	-,081	,141	,020
cq6	,526	,013	-,353	,336
cq7	,360	,065	-,198	,329
cq8	,497	,043	-,335	,471
cq9	,657	,248	,046	-,163
cq10	,052	,366	-,130	,097
cq11	,772	,109	,197	-,179
cq12	,268	,320	-,203	,073
cq13	,751	-,180	-,048	,023
cq14	,764	-,080	,066	-,106
cq15	,592	-,139	-,072	,090
cq16	,042	,133	,535	,224
cq17	,429	-,130	-,078	-,029
cq18	,614	-,228	,022	-,007
cq19	,720	-,058	,087	-,035
cq20	,548	,048	,116	-,055
cq21	,477	-,077	,053	,079

Items	Load.	M(ET)	R ^{2a}
(14) I feel sad	0.81	1.77(1.25)	0.751
(11) My level of stress and worries has increased	0.77	2.29(1.25)	0.716
(13) It bothers me. Limiting my focus to day-to-day	0.74	1.19(1.28)	0.707
(19) I feel nervous	0.73	1.77(1.28)	0.656
(33) I am discouraged about the future	0.73	1.42(1.35)	0.683
(1) It bothers me that my daily routine is altered	0.73	1.77(1.39)	0.679
(32) The need to manage my loved one's pain is overwhelming	0.69	1.98(1.46)	0.638
(9) I fear my loved one will die	0.63	2.04(1.53)	0.571
(18) I feel frustrated	0.63	0.98(1.21)	0.564
(29) It bothers me that my priorities have changed	0.63	0.81(1.01)	0.568
(2) My sleep is less restful	0.62	1.85(1.36)	0.558
(5) It is a challenge to maintain my outside interests	0.61	1.66(1.46)	0.551
(15) I feel under increased mental strain	0.61	1.49(1.52)	0.548
(3) My daily life is imposed upon	0.59	2.00(1.42)	0.529
(31) It upsets me to see my loved one deteriorate	0.59	2.41(1.43)	0.532
(20) I worry about the impact my loved one's illness has had on my children or other family members	0.57	1.27(1.36)	0.506
(26) The responsibility I have for my loved one's care at home is overwhelming	0.53	0.75(1.21)	0.449
(21) I have difficulty dealing with my loved one's changing eating habits	0.52	0.98(1.19)	0.459
(25) I fear the adverse effects of treatment on my loved one	0.52	2.43(1.22)	0.451
(30) The need to protect my loved one bothers me	0.52	1.27(1.35)	0.449
(6) I am under a financial strain	0.50	0.72(1.07)	0.444
(8) My economic future is uncertain	0.49	0.96(1.12)	0.426
(17) I feel guilty	0.39	0.51(0.94)	0.337

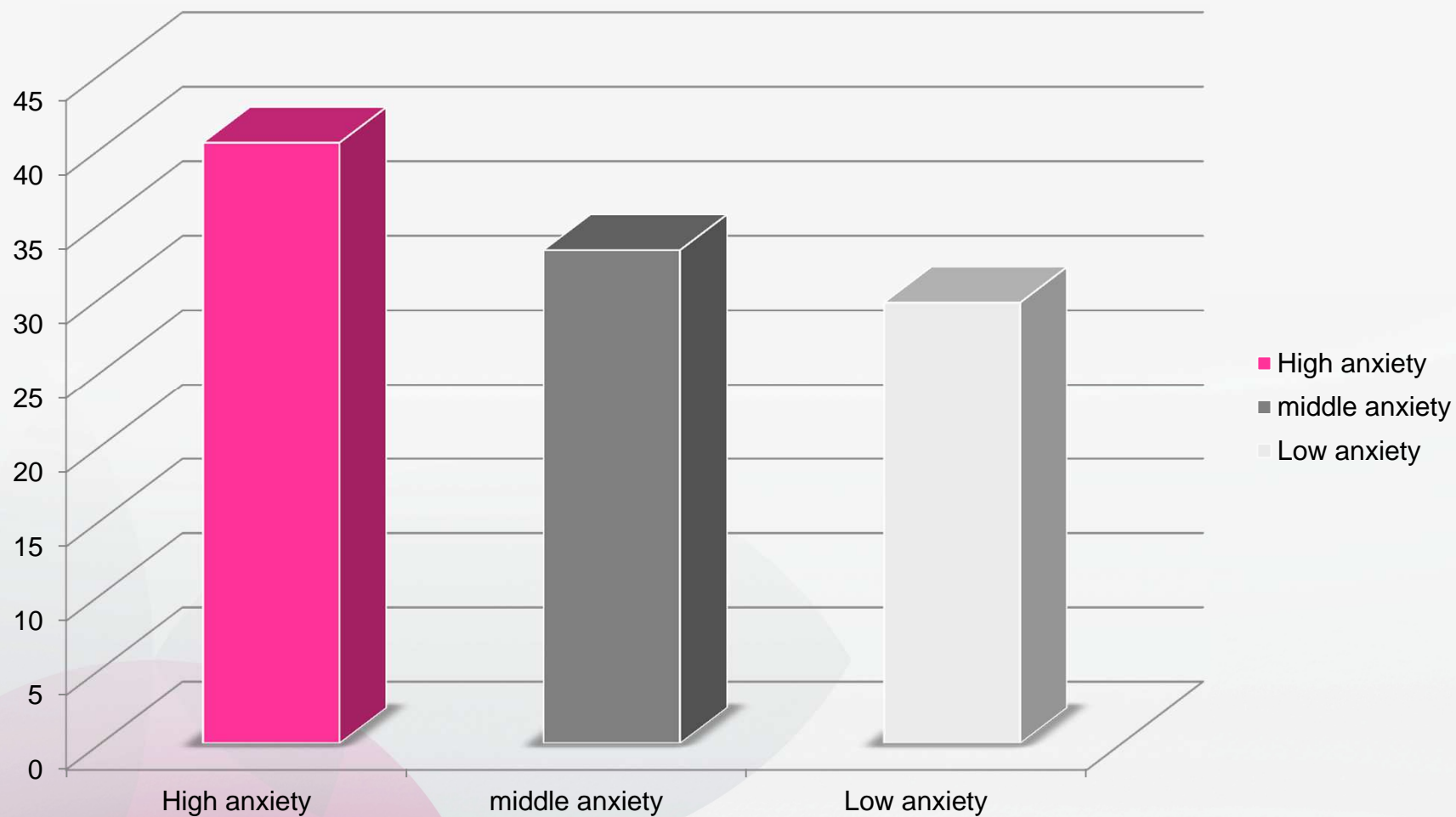
- The 35 variables were reduced to 1 factor
- This factor explain 38.76% of the total variance,
- 23-item scale ($\omega_t = .87$),
- Factor 1 could be interpreted as a QoL-impaired scale



Institut régional du Cancer
Montpellier | Val d'Aureille

Discriminant validity

Impaired Quality of Life



($F[2, 237] = 4.80, p < 0.01, \eta^2 = 0.04, \text{obs. power} = 0.793$)

Thanks to
Anaïs Lafaye, PhD
Stéphanie de Chalvron, PhD student
Nadine Houédé, MD
Houchingue Eghbali, MD

