EBOD 2009 Examination: Statistical evaluation of the results

SOE C14 (EDU) – How to be successful at the EBO examination? – June 14th, 2009

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No potential conflict of interest to disclose …

EBO Diploma Examination

- EBO Diploma Examination
  - Test designed to assess **knowledge** and **clinical skills** requisites to deliver a **European standard** of ophthalmologic care in hospital and private settings.
  - Organised on a **yearly basis** since its introduction in June 1995
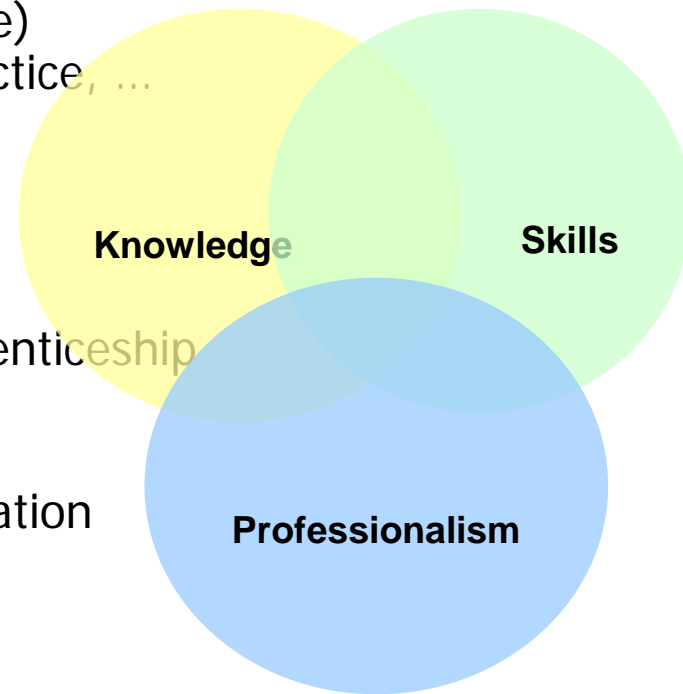
Components of education

- **Knowledge**
  - Textbooks, guidelines, articles, (online) courses, clinical ophthalmological practice, …
  - **EBOD MCQs + EBOD Viva Voce**
- **Skills**
  - Practical/technical skills
    → measure of ophthalmological apprenticeship
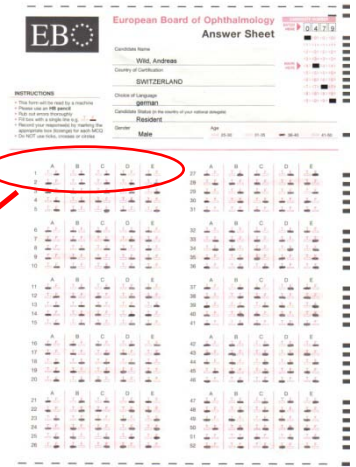- **Professionalism**
  - Personal skills: empathy, attitude, relation with related paramedicals, …

Knowledge

Skills

Professionalism

Structure of EBOD

- **Written paper**
  - 52 MCQs with 5 T/F items each (260 items)
  - 10 topics (see EBO website)
  - **40 percent** of total candidate score
  - Languages: **English**, **French**, **German**
  - Assessment of **knowledge**

- **Oral examination (Viva Voce)**
  - 4 different topics (see EBO website)
  - **60 percent** of total candidate score
  - Languages: **English** (native language)
 - Assessment of **knowledge**

Written paper (MCQs)

1. The age of onset of presbyopic symptoms

   a. Is earlier for a patient with a small amplitude of accommodation **TRUE**

   b. Is earlier for a hyperopic patient who wears contact lenses rather than spectacles **FALSE**

   c. Is earlier for a myopic patient who wears contact lenses rather than spectacles **TRUE**

   d. Is earlier for a myopic than a hyperopic patient who wears spectacles with full distance correction **FALSE**

   e. Is earlier for a short than a tall patient **TRUE**

STEM

LEAVES

	A	B	C	D	E
	T F	T F	T F	T F	T F
1					
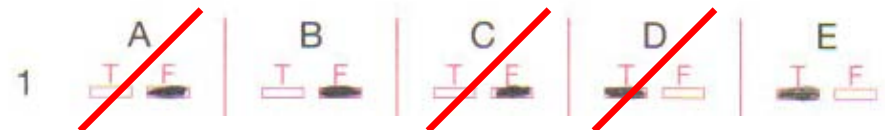
Correct answers (2 out of 5) are rewarded with 1 point
➜ This candidate receives 2 points

Written paper (MCQs)

- ## Scoring of the written paper
  - For each candidate a **total test score** is calculated (theoretical range: 0 – 260)
    ➔ sum of all items answered correctly by the candidate
  - The **average total test score** with according **standard deviation** is calculated
  - Based on the position of the individual total test score according to the average total test score, the candidate will receive a **mark** that will be situated **between 1 and 10**
  - This MCQ mark counts for **40 percent** of the total EBOD score

Written paper (MCQs)

- **Advantages for EBO candidates of T/F items**
  - Reliable in case of translation (English, French, German)
    ➔ choice of language will not result in being (dis)advantaged
  - Accessibility (e.g. dyslexia)
    ➔ not too complicated for candidates
  - Duration of the examination
    ➔ stress level of candidates can be kept to a minimum
  - Relatively easy to process
    ➔ results can be presented on-site

- **Disadvantage for EBO candidates of T/F items**
  - Probability of guessing right = 50 %
    ➔ level of weakest candidates is overestimated (➔ oral examination)

Written paper (MCQs)

- How to overcome the disadvantages of T/F items?
  - Introduction of negative marking
    - **Increase** of **discriminative power** of examination
    - Reduction of guess factor
      - **wild guesses** will be **punished** (weakest candidates)
      - guesses by reasoning (**partial knowledge**) will be **rewarded**

NEGATIVE MARKING AT EBOD 2010
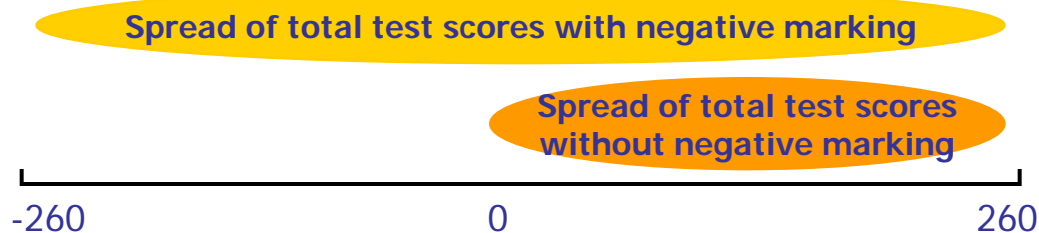
Spread of total test scores with negative marking

Spread of total test scores without negative marking

-260   0   260

Written paper (MCQs)

1. The age of onset of presbyopic sympt...

   STEM

   a. Is earlier for a patient with a small amplitude... ...ation **TRUE**

   LEAVES

   b. Is earlier for a hyperopic patient who wears contact lenses rather than spectacles **FALSE**

   c. Is earlier for a myopic patient who wears contact lenses rather than spectacles **TRUE**

   d. Is earlier for a myopic than a hyperopic patient who wears spectacles with full distance correction **FALSE**

   e. Is earlier for a short than a tall patient **TRUE**

NEGATIVE MARKING


```
       A        B        C        D        E
1    T   F    T   F    T   F    T   F    T   F
```
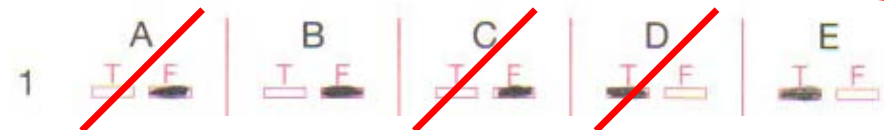
Correct answers (2 out of 5) are rewarded with 1 point
Incorrect answers (3 out of 5) result in −1 point
➔ This candidate receives −1 point

Written paper (MCQs)

- Scoring of the written paper

  NEGATIVE MARKING

  - For each candidate a **total test score** is calculated (theoretical range: -260 – 260)
    ➔ sum of all items answered correctly by the candidate
    minus sum of all items answered incorrectly by the candidate

  - The **average total test score** with according **standard deviation** is calculated

  - Based on the position of the individual total test score according to the average total test score, the candidate will receive a **mark** that will be situated **between 1 and 10**

  - This MCQ mark counts for **40 percent** of the total EBOD score

YOUR CHANCES TO PASS WILL NOT DECREASE BY INTRODUCING NEGATIVE MARKING

Oral examination (Viva Voce)

Oral examination (Viva Voce)

- ## Scoring of the oral examination
  - For each candidate a **viva voce score** is given for each topic (theoretical range: 1 – 10)
  - Each **individual viva voce score** counts for **15 percent** of the total EBOD score

$$EBOD_i = \left[0.4 \times MCQ_i\right] + \left[0.15\left(VVa_i + VVb_i + VVc_i + VVd_i\right)\right]$$

40 % MCQ-score

60 % Viva Voce score

Statistical analysis of EBOD 2009

Yearly increase of candidates

- ## SpeedWell
  - SpeedWell is specialised in organising medical examinations
  - Optical reader system
    - continuous and yearly increase of applications / interest in EBOD
  - Provided software tools
    - Design of the MCQ answer sheet
    - Design of the Viva Voce mark sheets
   - Statistical analysis output (MultiQuest®) based on similar statistical techniques

Number of Candidates

Year	Number
2005	74
2006	159
2007	224
2008	284
2009	308
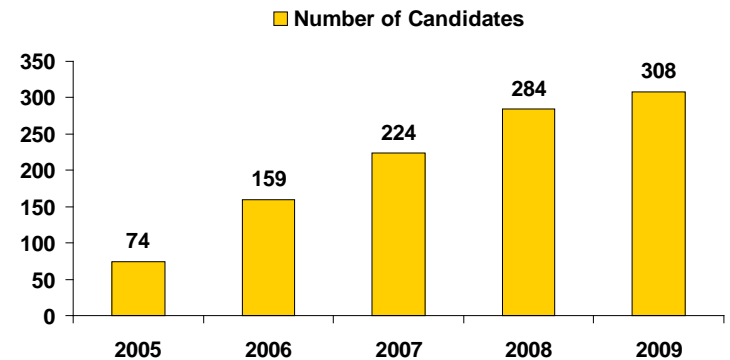
Demographics of EBOD 2009

Many EU countries apply

Country	2008	2009	Δ	Country	2008	2009	Δ
Austria	2	5	↑	Latvia	2	1	↓
Belgium	23	25	↑	Lithuania	1	1	→
Bulgaria		4	↑	Norway		1	↑
Czech Republic	2	2	→	Poland	1	2	↑
Denmark	4	6	↑	Slovakia	1	1	→
Estonia	3	2	↓	Slovenia	6	5	↓
Finland	7	2	↓	Spain	14	17	↑
France	92	96	↑	Sweden	6	5	↓
Germany	44	59	↑	Switzerland	32	29	↓
Greece	10	19	↑	The Netherlands	7	7	→
Hungary	1	2	↑	Turkey	11	5	↓
Ireland	5	5	→	United Kingdom	2	1	↓
Italy	4	6	↑	**Total**	**284**	**308**	↑

EBOD 2009: Analysis of MCQs

- **MCQ total scores**
  - Range of total scores: 154 – 230
  - Mean ± SD total score: 204.11 ± 13.04

EBOD 2009 MCQ Scores
with 95 % Confidence Intervals

Specialists (88)

Residents (220)
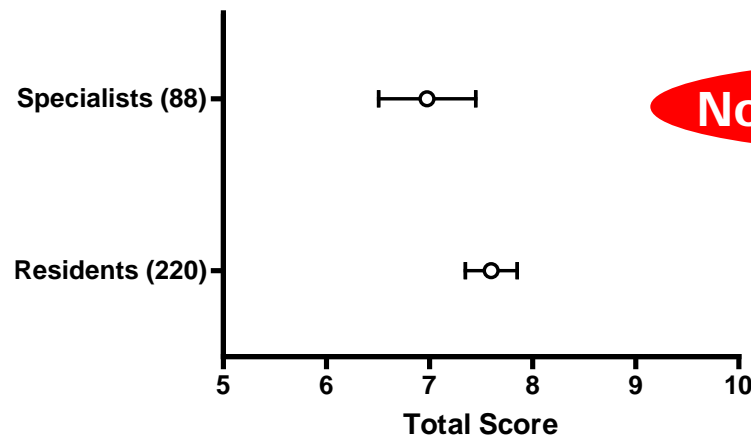
No significant difference!

Total Score

Residents	n = 220	205.40 ± 12.18	Specialists	n = 88	200.91 ± 14.41

EBOD 2009: Analysis of MCQs

No significant differences!

	Belgium	Switzerland	Germany	France
Residents	n = 21 207.71 ± 10.96	n = 29 207.97 ± 12.22	n = 39 209.67 ± 10.46	n = 84 201.52 ± 11.22
Specialists	n = 4 181.25 ± 20.22		n = 20 206.10 ± 15.57	n = 12 200.58 ± 15.20
Total	n = 25 203.48 ± 16.14	n = 29 207.97 ± 12.22	n= 59 208.46 ± 12.54	n = 96 201.41 ± 11.80

Residents have **higher total MCQ scores** with **lower standard deviations** when compared to specialists.

In general there are **no statistically significant differences** between **countries**.

EBOD 2009: Analysis of MCQs

EBOD is not a language test!

	English	German	French
Residents	n = 58 205.98 ± 12.54	n = 61 209.46 ± 11.51	n = 101 202.60 ± 11.62
Specialists	n = 53 200.08 ± 12.71	n = 21 205.67 ± 15.27	n = 14 196.93 ± 17.06
Total	n = 111 203.16 ± 12.96	n= 82 208.46 ± 12.54	n = 115 201.91 ± 12.55

Residents have **higher total MCQ scores** with **lower standard deviations** when compared to specialists.

In general there are **no statistically significant differences** between **languages**.

EBOD 2009: Analysis of MCQs

- Cronbach's coefficient alpha (r) = 0.78

  - Estimator of the lower bound of the **internal consistency** (degree to which all MCQs leaves are measuring the same, i.e. knowledge of candidates) of EBOD 2009 (95% CI: 0.75 – 0.81)

internal consistency of EBOD MCQ-test is good

$$r = \frac{260}{260 - 1} \left[1 - \frac{\displaystyle\sum_{i=1}^{260} \sigma_i^2}{\left(\displaystyle\sum_{i=1}^{260} Rit_i \sigma_i\right)^2} \right] = 0.78$$

EBOD 2009: Analysis of MCQs

- Point biserial correlation coefficient (Rit) = 0.14
  - Estimator of the correlation between the **individual item scores X_i** (either 0 or 1) and the **total MCQ scores Y_i** (ranging from 154 to 230) of the candidates

$$Rit = \frac{1}{n-1} \sum_{i=1}^{n} \left(\frac{X_i - \overline{X}}{s_X} \right) \left(\frac{Y_i - \overline{Y}}{s_Y} \right)$$

**correlation between item and total MCQ score**

-1   0   +1
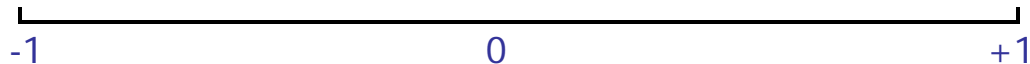
EBOD 2009: Analysis of MCQs

- ## Assessment of the degree of difficulty
  - ### Average P-value ≈ 0.79
    - Indication of items answered incorrectly by guessing ≈ 0.21
    - Estimation of items answered correctly by guessing ≈ 0.21
    - Estimation of percentage of candidates guessing ≈ 0.42
      OR Estimation of percentage of candidates knowing ≈ 0.58

Answered by knowledge

Answered by guessing

0   58   79   100
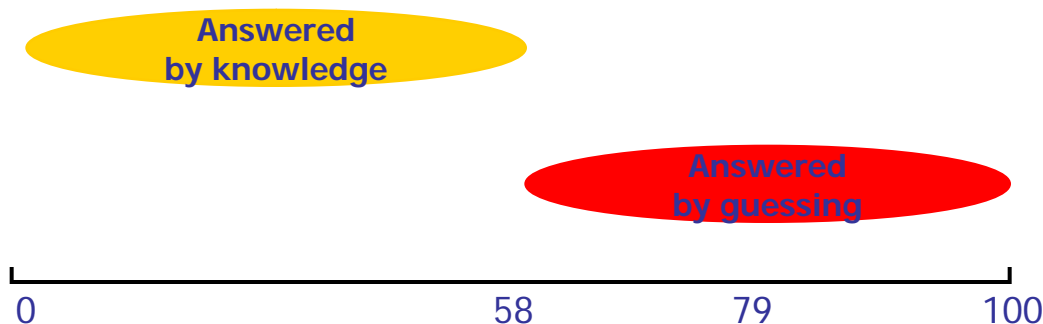
EBOD 2009: Viva Voce analysis

EBOD 2009 Viva Voce Scores
with 95 % Confidence Intervals

Specialists (88)

Residents (220)

| 5 | 6 | 7 | 8 | 9 | 10 |

Total Score
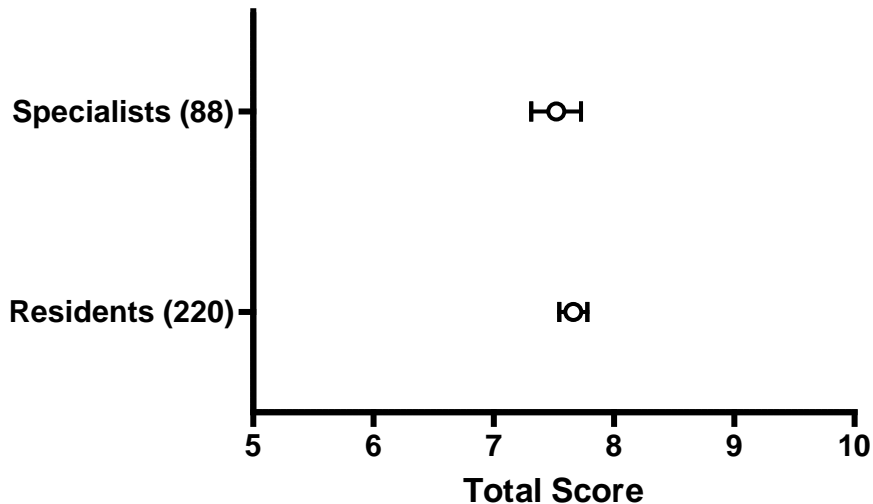
| Topic	Score
A. Optics, Refractions, Strabismus and Neuro-ophthalmology	7.62 ± 1.32
B. Cornea, External diseases and Ocular adnexa	7.59 ± 1.29
C. Glaucoma, Cataract and Refractive surgery	7.45 ± 1.24
D. Posterior segment, Ocular inflammation and Uveitis	7.83 ± 1.28

EBOD scores are high!

Residents have **higher Viva Voce scores** with **lower standard deviations** when compared to specialists.

No statistically significant differences between the **topics**.

EBOD 2009: General analysis

EBOD 2009 Total Scores
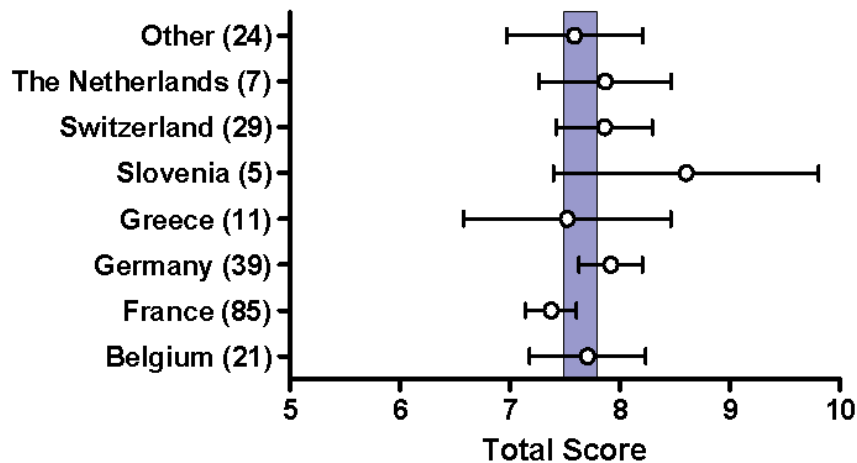**with 95 % Confidence Intervals**
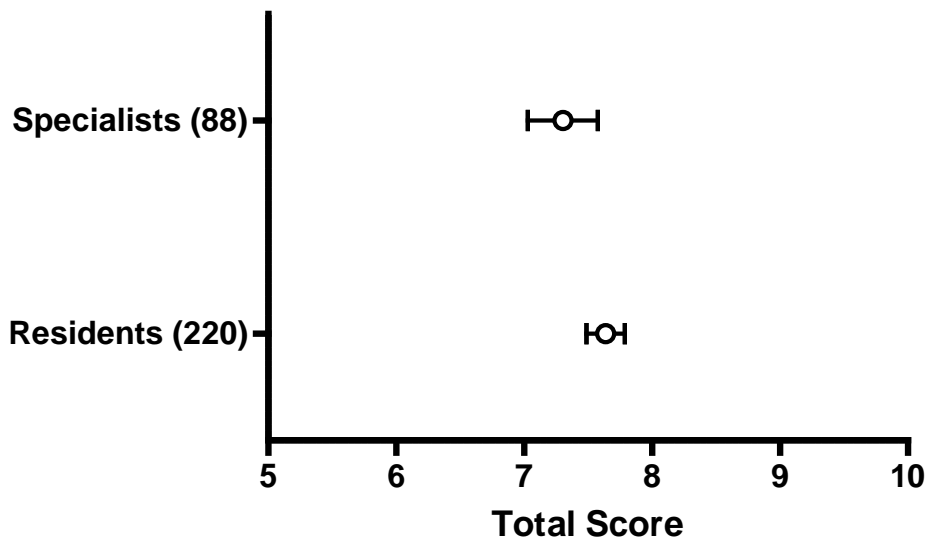
EBOD 2009	Score
Written examination (MCQ paper)	7.42 ± 2.01
Oral examination (Viva Voce)	7.62 ± 0.90
EBOD 2009 (MCQ + Viva Voce)	7.54 ± 1.18

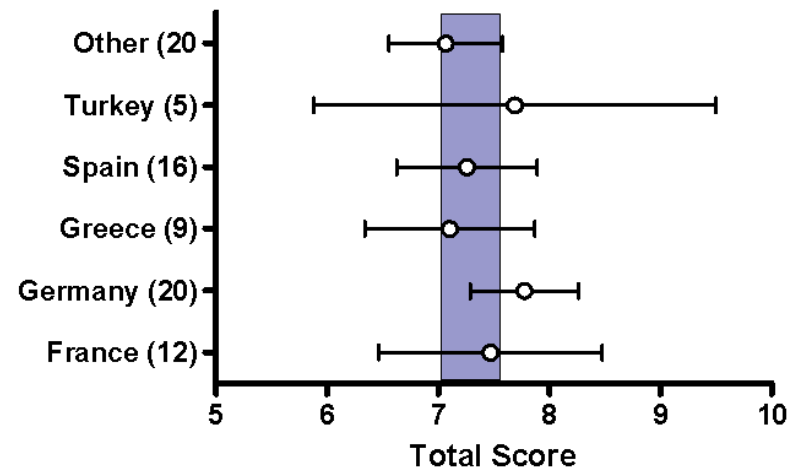**EBOD scores are comparable for MCQ and Viva Voce!**

Residents have **higher Viva Voce scores** with **lower standard deviations** when compared to specialists.

EBOD 2009: General analysis

EBOD 2009 Total Scores Residents
with 95 % Confidence Intervals

EBOD 2009 Total Scores Specialists
with 95 % Confidence Intervals

Residents have **higher total scores** with **lower standard deviations** when compared to specialists.

No significant differences are observed between the **countries**.

EBOD 2009: Success rate

Success rate of EBOD is much higher as compared to other medical specialties (60-70 %)

	2005	2006	2007	2008	2009
Success Rate	87.6%	88.1%	89.2%	90.8%	89.6 %

EBOD **success rate** is quite **stable over the years** and quite high as the level of candidates usually tends to be good.

18 Residents (out of 220: 8.2%) and **14 specialists** (out of 88: 15.9 %) failed at EBOD 2009. As there were 308 candidates the general failure rate was 10.4 %.

In conclusion...

- There are absolutely **no reasons** for you **not to participate** at EBOD since ...

  - ... EBOD examination is a chance to show your **excellence** in ophthalmology on a **European** level

  - ... EBOD has a **high success rate** (compared to European examinations of other medical specialties)

  - ... It has been shown by EBO that the level of candidates participating is usually very good, which results in **very good individual marks**

In conclusion…

- There are absolutely **no reasons** for you **not to participate** at EBOD since …

  - … It has been demonstrated that **language** nor **country of origin** (dis)advantage candidates

  - … It has been shown that **residents** perform well at prior EBOD editions

  - … Introduction of **negative marking** will only be **beneficial** for good candidates! Furthermore introduction of negative marking **will not decrease** your **chances to be successful** at EBOD

In conclusion…

... Therefore EBO hopes to welcome
you all at EBOD 2010!