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Measuring the quality of interlingual live subtitles via respeaking: insights from the SMART project

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SMART

Shaping Multilingual Access through Respeaking Technology

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Quality in SMART

Quality as a **multidimensional**, **elusive** and **relative** concept

Our focus is on **ACCURACY** in **interlingual respeaking**

To refine our understanding of what contributes to output accuracy

- what accuracy benchmark can language professionals achieve after 25h of upskilling
- which variables are predictors of accuracy
- how do different conditions impact on performance

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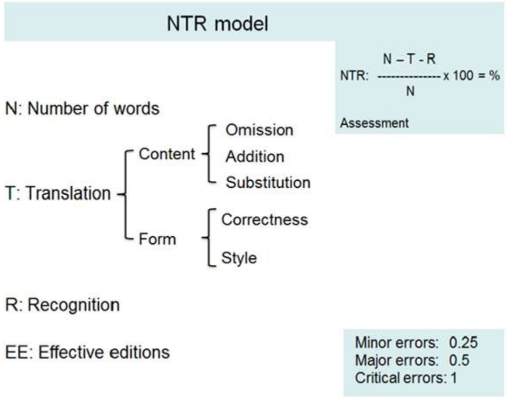
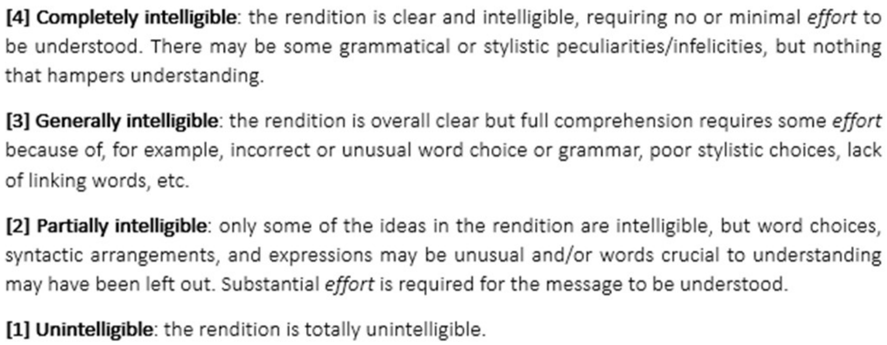
Approach to measuring accuracy

Accuracy operationalised as **informativeness + intelligibility**

Accuracy measured via NTR model (Romero-Fresco and Pöchhacker 2017) applied to 153 performances under different scenarios.



Intelligibility scale (based on Tiselius 2009) to determine high and low performers, which was validated in the results obtained.



[4] Completely intelligible: the rendition is clear and intelligible, requiring no or minimal *effort* to be understood. There may be some grammatical or stylistic peculiarities/infelicities, but nothing that hampers understanding.

[3] Generally intelligible: the rendition is overall clear but full comprehension requires some *effort* because of, for example, incorrect or unusual word choice or grammar, poor stylistic choices, lack of linking words, etc.

[2] Partially intelligible: only some of the ideas in the rendition are intelligible, but word choices, syntactic arrangements, and expressions may be unusual and/or words crucial to understanding may have been left out. Substantial *effort* is required for the message to be understood.

[1] Unintelligible: the rendition is totally unintelligible.

Participants

51 language professionals selected out of 250+ applicants

Professional backgrounds: 2,000h+ work experience in translation, interpreting and/or pre-recorded/live subtitling; majority with 3+ professions (composite profiles)

Languages: 17 participants between EN and each romance language (French/Italian/Spanish);
32 EN>Romance; 19 Romance>EN

Demographics: 8 males, 43 females (*Mage* = 40.12 years, *SD* = 10.97 years); from 11 countries (UK, Spain, Italy, France, Germany, Belgium, Australia, Argentina, New Zealand, USA, Peru)

Materials

- Intra and interlingual tests – INTERLINGUAL results analysed
- 12 speeches
  - 4 languages: English, Spanish, French, Italian
  - 3 different source input conditions

SPEED	PLANNED/UNPLANNED	MULTIPLE SPEAKERS
M duration 15'+	*M* duration 12'	*M* duration 12'
140 wpm	110 wpm	120 wpm

- Controlled variables: topic (respeaking-themes), vocabulary (brief), numbers
- Randomisation of testing (ABC-CBA)

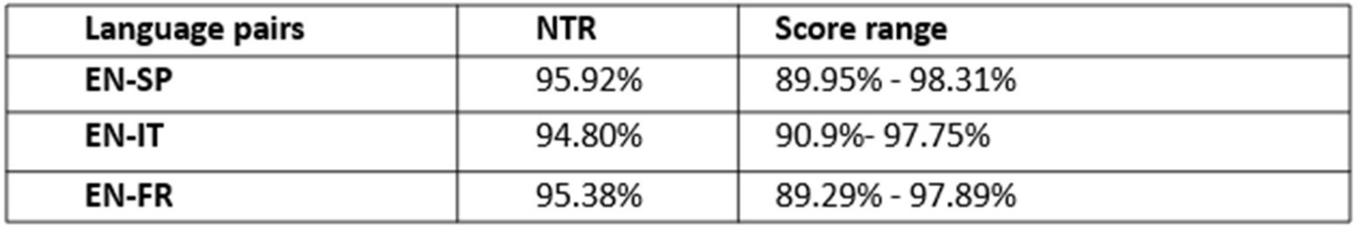
> I really loved that, it [...] enabled demonstration of practical skills with as little interference from an unfamiliar topic as possible.

> Testing materials [...] could correspond to the difficulty level to everyday demanding tasks

Accuracy after 25h of upskilling

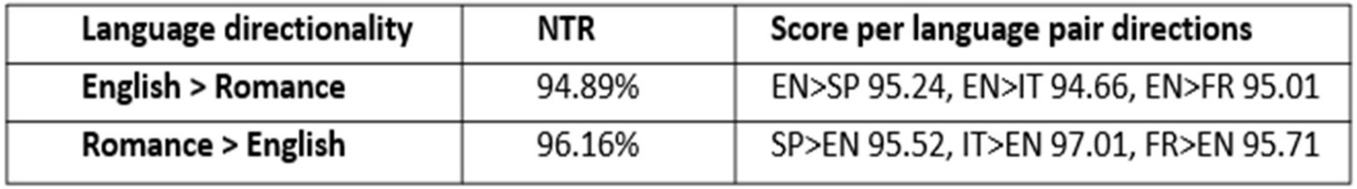
Average NTR score across all participants and conditions: 95.37%

Average NTR scores per language pair



Language pairs	NTR	Score range
EN-SP	95.92%	89.95% - 98.31%
EN-IT	94.80%	90.9%- 97.75%
EN-FR	95.38%	89.29% - 97.89%

Average NTR scores per language directionality



Language directionality	NTR	Score per language pair directions
English > Romance	94.89%	EN>SP 95.24, EN>IT 94.66, EN>FR 95.01
Romance > English	96.16%	SP>EN 95.52, IT>EN 97.01, FR>EN 95.71

Language professionals

SUBGROUPS

HIGH/LOW PERFORMERS

- High performers: 27/51
- Low performers 24/51

** Informativeness threshold: 96%*
** Intelligibility threshold: 16*
TOT: 45/153 performances

PROFESSIONAL CLUSTERS

- Spoken-to-Spoken: 17/51
- Spoken-to-written: 16/51
- Mixed: 16/51

** 2 outliers*

Accuracy after 25h of upskilling

HIGH vs LOW performers

Significant difference in accuracy performance across all scenarios, *p* < .001

***M* = 96.3% (high) and *M* = 94.4% (low)**

***M* = 97.1% (top 12) and *M* = 94.8% (other 39)**

PROFESSIONAL CLUSTERS

No statistical differences between clusters, *p* > .05

- Spoken to spoken: *M* = 95.4%
- Spoken to written: *M* = 95.3%
- Mixed: *M* = 95.3%

Accuracy predictors: errors

Across all participants and all source inputs

Errors as **negative** predictors

- **Omissions (OM)** (β = -1.12, p < .001) [MAJ β = -.071; MIN β = -.19]
- **Recognition (R)** (β = -.34, p < .001)
- **Substitutions (SUB)** (β = -.17, p < .001)

Effective editions (EE) as **positive** predictor (β = .31, p = .03)

High vs low performers

MajOM (HM = 24.84; LM = 36.59), p = .004.

MinOM (HM = 34.84; LM = 40.10), p = .09.

MajSUB (HM = 4.58; LM = 6.44), p = .03.

MajR (HM = 4.43; LM = 7.29), p = .07.

MinADD (HM = 1.52; LM = 2.78), p = .02.

MinCORR (HM = 12.02; LM = 18.69), p = .02.

EE Ave: F(1, 49) = 4.71, p = .04. H used EEs more (M = 43.19) than L (M = 37.17).

High performers

MinOM (β = -.35), p = .027.

MajOM (β = -.58), p < .001.

Low performers

MajOM (β = -.72), p < .001.

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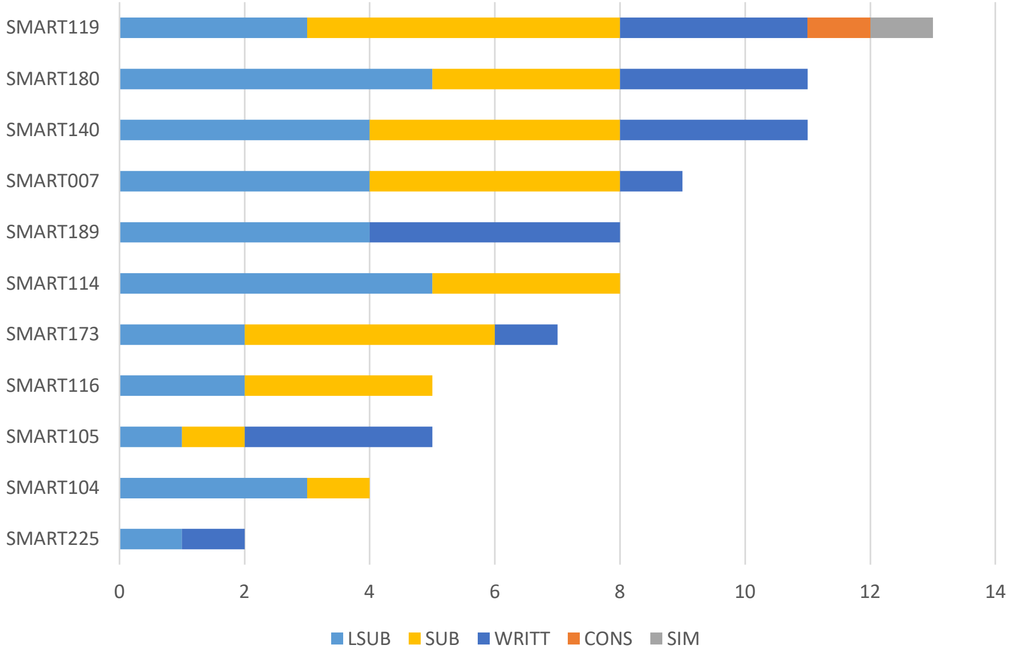
Accuracy predictors: professional background

Professional background – ALL

No statistical differences (*p* > .05) between professional clusters (spoken-to-spoken; spoken-to-written; mixed) pointing to no cluster providing an advantage over another, but…

Linear Regression

- Live subtitling as a **positive predictor** *F*(1, 49) = 2.38, *p* = .02, β = .32.



Impact of source input on performance

Average NTR scores **source input condition**

Significant difference as *p* = .008

SPEED: 94.8%

- **Spanish 95.3%**
- **French 95.1%**
- **Italian 95.9%**

PLANNED/UNPLANNED: 95.8%

- **Spanish 95.6%**
- **French 96%**
- **Italian 94.9%**

MULTIPLE SPEAKERS: 95.5%

- **Spanish 95.9%**
- **French 95.13%**
- **Italian 95.5%**

Impact of source input on performance

HIGH (27) vs LOW (24) performers:
significant difference in accuracy performance across all scenarios, *p* < .001

- Speed: *M* = 95.5% (high) and *M* = 93.9% (low)
- PU: *M* = 96.8% (high) and *M* = 94.8% (low)
- MS: *M* = 96.5% (high) and *M* = 94.4% (low)

TOP (12) vs OTHERS (39) performers:
significant difference in accuracy performance across all scenarios, *p* < .001

- Speed: *M* = 96.8% (top) and *M* = 94.1% (others)
- PU: *M* = 97.2% (high) and *M* = 95.4% (low)
- MS: *M* = 97.2% (high) and *M* = 95.0% (low)

A qualitative approach: TAP data analysis

TAP comments produced by the 27 **HIGH performers**

- **Speed:** 8 subjects
- **Multiple speakers:** 15 subjects
- **Planned/unplanned:** 22 subjects

The TAP comments were analysed and grouped by **thematic category** to identify the root cause of the reported problem and the strategy adopted to tackle it (if any)

- **Source-input related**
- **Technique-related**
- **Technology-related**
- **Person-related**

Key findings from TAP data analysis

- Most TAP comments focused on **TECHNIQUE** rather than on the characteristics of the source materials.
- Most frequently mentioned challenges:
  - **décalage** (keeping up the pace)
  - **live error correction**
  - (**audiovisual**) **monitoring**
  - **software-adapted delivery (SAD):** clear pronunciation (dictionary form) + neutral intonation + clear articulation + strategic pausing behaviour for chunking
- Comprehension issues mentioned in some TAPs, but often related to other challenges (i.e., missed part of a sentence because of time lag, voice overlap, typing a correction, etc.)
- Low number of comments on technology *per se*. Some comments on **human-machine interaction** (i.e., insufficient vocabulary training, inefficient macros, etc.)

SPEED task

On average, more TAP comments on the SPEED task > the longest and hardest test (lowest NTR scores)

- Most of the comments focus on
  - comprehension problems
  - the effect of speed on the respeaker's SAD
  - output monitoring
  - performing live corrections at speed
- All the challenges encountered in the other tasks are magnified by speed
- Suggested coping strategies:
  - increasing décalage to gain more context and then compressing
  - anticipating potential recognition problems and avoiding certain words or typing them
  - strategic omissions of secondary information

MULTIPLE SPEAKERS task

- The majority of TAP comments are focused on technique:
  - comprehension problems often related to décalage
  - SAD often mentioned in conjunction with output monitoring or translation difficulties
  - issues with sound and volume management
  - overlapping talk/cross over between speakers (question-answer)

- Coping strategies:
  - omission of less important items (e.g. hesitations, interjections, conversation markers...)
  - pausing to improve recognition (better chunking)
  - live correction: pause, wait for the text to be displayed, correction

PLANNED/UNPLANNED task

- Again, the most common comments are on technique:
  - SAD issues
  - Output monitoring (multiple visual input, in relation to the questions that were displayed in a written form)
- Technology: software preparation and working set-up
- A higher number of TAPS on the source material, i.e., audio quality, technical topic and complex structures > comprehension problems

Coping strategies:

- longer décalage for better comprehension and better TL reformulation
- omitting items that have not been understood
- prioritising meaning over error correction
- anticipating recognition problems and using macros or typing

Implications of TAP analysis

- When reporting **problems**, subjects were often able to indicate **solutions**
- Given the short duration of the course, the fact that subjects have been able to automate some behaviours and develop coping strategies is encouraging

- Examples:
  - dictating has become second nature;
  - SAD still poses challenges but overall has become more of a habit
  - being able to anticipate recognition problems and using either synonym, macro or typing;
  - pausing frequently to enable *Dragon* to display the output faster;
  - chunking to avoid using too much punctuation;
  - strategic omissions (of less important items or items that have not been fully understood)

Conclusions/I

- Large-scale validation of NTR model (**intertextual dimension**)
- Significance of NTR data enhanced by integration of an intelligibility scale (**intratextual dimension**)
- Other aspects of the live subtitling service (such as delay) to be added for a more holistic view (**instrumental dimension**)
- Need to **review and validate the accuracy benchmark** for interlingual respeaking?

Conclusions/II

- Integration of statistical methods allowed for focus from **macro** (all participants) to **micro** (specific subgroups) to build **evidence-base** – requires expertise
- Implications for upskilling:

  - **Evidence** that experience in live (intralingual) subtitling provides a clear advantage: automated processes (interaction with technology) that make it easier to add language transfer component

  - **Evidence** that other profiles (spoken-to-spoken, mixed...) may also acquire interlingual respeaking skills, but may need to focus more on the human-machine interaction component

- Modular approach to upskilling ("pick and choose")

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Thank you for your attention!

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