Recently, \citeA{pauci} introduced a procedure aimed at integrating the principles of CAT procedures (i.e., tailoring the item administration to specific latent trait levels) for the development of static STFs from full-length tests. The newly introduced procedure, denoted as $\theta$- target procedure, grounds the item selection on the measurement precision of each item in the full-length test with respect to specific latent trait levels of interest, denoted as $\theta\_{target}$. The $\theta\_{target}$s are defined a priori according to the specific aim with which the STF is developed. For instance, if the aim of the STF is to discriminate respondents below and above a certain cut-off (e.g., clinical diagnostic tests) the $\theta\_{target}$s are defined around the cut-off point, such that only the most informative items for that region of the latent trait are included in the STF. Otherwise, if the aim is to maximize the information across the entire latent trait, the $\theta\_{target}$s can be equally spread along the latent trait continuum.

The $\theta$-target procedure starts from an $I \times T$ matrix, where $i = \{1, \ldots, I\}$ are the items in the full-length test and $n = \{1, \ldots, N\}$ are the defined $\theta\_{target}$s. Each cell of the matrix contains the measurement precision of item $i$ with respect to theta target $n$, as expressed by the \emph{item information function} (IIF). The final aim is to choose an optimal item (i.e., the item with the highest IIF) for each of the $\theta\_{target}$s.

Although the$\theta$-target procedure showed promising results when compared against the typical procedure for developing static STF (i.e., the selected items are the most informative item, irrespective of their locations on the latent trait), it presents some shortcomings that need to be addressed. The item selection in based on the $\theta\_{target}$s, which are punctual latent trait levels. This might have two consequences. Firstly, since an optimal item is chosen for each of the $\theta\_{target}$s, the actual number of theta targets influences the number of items included in the STFs. It follows that the more the STF wants to precisely measure larger regions of the latent trait, the more the selected theta targets and the more the number of items that need to be included in the STF. Moreover, the theta targets are defined as punctual values on the latent trait, while it might be more convenient to define, instead of discrete values, a continuous functions that describes the characteristics of the STF one would like to reproduce. In other words, it might be more convenient to define the desired measurement precision of the STF by means of a test information function target rather than by providing discrete latent trait values.

Finally, the well functioning of the theta target procedure strongly depends on the definition of the theta targets and on the availability in the item bank of informative items with respect to those theta targets. Given that the procedure does not stop until an optimal item for each theta target has been found, if the item bank does not contain informative items with respect to one or more theta targets, sub-optimal items might be included in the final item selection.

TERMINATION CRITERION

The termination criterion considers the target information function, the information function obtained from the STF with the last item considered for inclusion, and the information function obtained from the STF without this last item. If the distance between the former two is greater than or equal to the distance between the latter two, the algorithm stops and the final item selection is the one without the last selected item. Vice versa, the item is included in the STF and the algorithm starts a new iteration.

Specifically, two of the presented algorithms can be seen as the natural evolution of the $\theta$-target procedure, in that they ground the item selection on the characteristics of each item with respect to a specific $\theta$ target.

Differently from the $\theta$-target procedure, the new algorithms automatically define the $\theta$ target at each iteration as the level of the latent trait for which the maximum distance between the information function obtained from the items selected up to that iteration and the target information function is observed. In other words, these algorithms attempt at bridging the gap between the two information functions considering one discrete level at the time.

The number of items does not need to be defined a priori and the algorithms automatically searches for the levels of the latent trait that need to be addressed at each iteration. The main issue related to these algorithms is that they ground the item selection on discrete levels of the latent trait instead of accounting for its continuous nature.

The third algorithm aims at overcoming this issue by considering the continuous nature of the target information function. At each iteration, it explores the distance between the target information function and the information function obtained with the items selected up to that iteration, and selects the item that is best able to bridge the gap between the target and the temporary information function considering the entire latent trait. As such, this algorithm overcomes the definition of the $\theta$ targets altogether and allows for considering the measurement precision of each item with respect to the entire latent trait and to the target information function.

DISCORSO SULLA TIF MEDIA

It follows that if the comparison between a TIF target and the TIF of the STF is used as criterion for choosing the item selection best able to reproduce the TIF target, the lower the number of items included in the STFs, the greater the distance, such that STFs with a lower number of items are penalized in favor of STF with higher number of items. To avoid this issue, the comparison can be among average TIFs, which can be obtained by dividing the TIFs by the number of items.