

Talk the talk and walk the walk. Evaluation of autonomy in aging and Alzheimer Disease by simulating instrumental activities of daily living: The S-IADL (#9121)

1

First revision

Please read the **Important notes** below, and the **Review guidance** on the next page.
When ready [submit online](#). The manuscript starts on page 3.

Important notes

Editor and deadline

Jafri Abdullah / 17 Jun 2016

Files

1 Tracked changes manuscript(s)

1 Rebuttal letter(s)

1 Figure file(s)

3 Table file(s)

1 Raw data file(s)

Please visit the overview page to [download and review](#) the files not included in this review pdf.

Declarations

Involves the study of human participants/human tissue.



Please in full read before you begin

How to review

When ready [submit your review online](#). The review form is divided into 5 sections. Please consider these when composing your review:


1. BASIC REPORTING

2. EXPERIMENTAL DESIGN

3. VALIDITY OF THE FINDINGS






4. General comments

5. Confidential notes to the editor





 You can also annotate this **pdf** and upload it as part of your review

To finish, enter your editorial recommendation (accept, revise or reject) and submit.





BASIC REPORTING

-  Clear, unambiguous, professional English language used throughout.
-  Intro & background to show context. Literature well referenced & relevant.
-  Structure conforms to [PeerJ standard](#), discipline norm, or improved for clarity.
-  Figures are relevant, high quality, well labelled & described.
-  Raw data supplied (See [PeerJ policy](#)).

EXPERIMENTAL DESIGN

-  Original primary research within [Scope of the journal](#).
-  Research question well defined, relevant & meaningful. It is stated how research fills an identified knowledge gap.
-  Rigorous investigation performed to a high technical & ethical standard.
-  Methods described with sufficient detail & information to replicate.

VALIDITY OF THE FINDINGS

-  Impact and novelty not assessed. Negative/inconclusive results accepted. *Meaningful* replication encouraged where rationale & benefit to literature is clearly stated.
-  Data is robust, statistically sound, & controlled.
-  Conclusion well stated, linked to original research question & limited to supporting results.
-  Speculation is welcome, but should be identified as such.

The above is the editorial criteria summary. To view in full visit <https://peerj.com/about/editorial-criteria/>

Talk the talk and walk the walk. Evaluation of autonomy in aging and Alzheimer Disease by simulating instrumental activities of daily living: The S-IADL

Véronique Quaglino ^{Corresp., 1}, Yannick Gounden ¹, Emilie Lacot ^{1,2}, Frédérique Couvillers ³, Amandine Lions ⁴, Mathieu Hainselin ¹

¹ Université de Picardie Jules Verne, CRPCPO, EA 7273, Amiens, France

² Service de Génétique Clinique et Oncogénétique, Centre Hospitalier Universitaire d'Amiens Picardie, Amiens, France

³ Services de neurologie et de gériatrie, Centre Hospitalier Universitaire d'Amiens Picardie, Amiens, France

⁴ IME Les Martinets, Adapei 36 l'Espoir, Saint Maur, France

Corresponding Author: Véronique Quaglino

Email address: veronique.quaglino@u-picardie.fr



The autonomy of individuals is linked to the achievement of instrumental activities of daily living that require complex behavior. In elderly, the assessment of autonomy is usually based on questionnaires that have strong subjective constraints. Considering this fact, we tested on elderly healthy adults and Alzheimer disease patients, a new measure, the S-IADL (Simulation of Instrumental Activities for Daily Living) to assess the ability to perform effectively activities of daily living. The S-IADL shares many items with the well-known IADL questionnaire proposed by Lawton and Brody (1969). However, as opposed to the IADL, the assessment of autonomy is not based on the completion of a questionnaire but requires the realization or simulation of various activities of daily living. Eighty-three participants (69 healthy elderly, and 14 Alzheimer Disease patients) filled in the IADL and performed the S-IADL assessment. Results revealed that like the IADL, the S-IADL is able to identify AD patients who are likely to encounter difficulties in performing everyday activities, and no major differences were found between the IADL and the S-IADL. However, this preliminary study reveals some advantages for privileging new tool based on simulation of activities in functional evaluation particularly in specific situation. Finally, we discuss of the main limits of the S-IADL that should be investigated prior to its utilization by clinicians.

Talk the talk and walk the walk. Evaluation of autonomy in aging and Alzheimer Disease by simulating instrumental activities of daily living: The S-IADL

Véronique QUAGLINO¹, Yannick GOUNDEN¹, Emilie LACOT^{1,2}, Frédérique COUVILLERS³, Amandine LIONS⁴, Mathieu HAINSELIN¹

¹ CRPCPO, EA 7273, Université de Picardie Jules Verne, Amiens, France

² Centre Hospitalier Universitaire d'Amiens Picardie, Service de Génétique Clinique et Oncogénétique, Amiens, France

³ Centre Hospitalier Universitaire d'Amiens Picardie, Services de Neurologie et de Gériatrie, Amiens, France

⁴ IME Les Martinets, ADAPEI 36 36 l'Espoir, Saint Maur, France

Correspondence should be addressed to:

Véronique QUAGLINO

Centre de Recherche en Psychologie : Cognition, Psychisme, et Organisations (CRPCPO, EA7273)

Université de Picardie Jules Verne

Chemin du Thil - 80025 Amiens Cedex 1, France

veronique.quaglino@u-picardie.fr

Tél. : +33 3 22 82 74 10

Fax. : +33 3 22 82 74 08

Abstract

Objective: The autonomy of individuals is linked to the achievement of instrumental activities of daily living that require complex behavior. In elderly, the assessment of autonomy is usually based on questionnaires that have strong subjective constraints. Considering this fact, we tested on elderly healthy adults and Alzheimer disease patients, a new measure, the S-IADL (Simulation of Instrumental Activities for Daily Living) to assess the ability to perform effectively activities of daily living.

Method: The S-IADL shares many items with the well-known IADL questionnaire proposed by Lawton and Brody (1969). However, as opposed to the IADL, the assessment of autonomy is not based on the completion of a questionnaire but requires the realization or simulation of various activities of daily living. Eighty-three participants (69 healthy elderly, and 14 Alzheimer Disease patients) filled in the IADL and performed the S-IADL assessment.

Results: Results revealed that like the IADL, the S-IADL is able to identify AD patients who are likely to encounter difficulties in performing everyday activities, and no major differences were found between the IADL and the S-IADL.

Conclusions: We outlined some advantages for privileging in certain situation, this new tool based on simulation of activities in functional evaluation. Finally, we discuss the main limits of the S-IADL that should be investigated prior to its utilization by clinicians.

INTRODUCTION


The present study concerns the estimation of personal autonomy in aging and Alzheimer disease. More precisely, instead of using typical self-evaluation questionnaires, we devised a new tool to evaluate individuals' capacity in performing common activities of daily living. Two considerations guided this new tool proposal. First, the evaluation of autonomy must reflect to some extent, the real life of the person and secondly, it should not rely solely on the appreciation of the patient and caregivers who may not always be objective. We thus proposed a new tool which accesses autonomy through the simulation of daily living activities.

Autonomy is a systemic and multidimensional entity which encompasses sensorimotor, psychosocial, cognitive and medical aspects (Eghbal-Téhérani & Makdessi, 2011). Physical activity, social relationships, psychological well-being and cognitive functioning are thus among the many factors that can give an insight on an individual's degree of autonomy. The term functional autonomy refers to the ability to perform activities of daily living (ADL) (Perrig-Chiello, Perrig, Uebelbacher, & Stähelin, 2006), at different levels: basic activities (eating, moving, toileting or shower/bath taking) and more complex instrumental activities (medication taking, shopping or managing a budget). These instrumental activities of daily living (IADL) require good organizational, judgment and sequencing abilities (Royall, Chiodo, & Polk, 2000). The loss of functional autonomy is generally the result of an imbalance between the functional capacities of an individual and the social and material resources available. Functional autonomy generally decreases with aging, as a consequence of the wide range of physical, cognitive, emotional, and/or social changes. This lost in autonomy is even more important for people

with Alzheimer Disease (Jekel et al., 2015). However, these changes being characterized by interindividual heterogeneity, the assessment of elderly people's functional autonomy should therefore be specific and personalized in order to target their needs and to develop appropriate services. Such type of assessment is to our knowledge problematic due to a lack of appropriate tools for an efficient evaluation of functional autonomy in elderly adults.

In France, the AGGIR (*Autonomie G rontologie Groupes Iso-Ressources* for Autonomy Gerontology Groups Iso-Resources) grid is commonly used to assess the degree of dependence of a person by classifying him or her, in one of the 6 categories (GIR 1 to GIR 6). Personal Autonomy Allowance (PAA) is granted to dependent older people classified in the first 4 GIR groups. People classified in GIR 1 are considered to be in the highest dependency and are thus allotted more help which decreases from GIR 1 to GIR 4 (Bontout, Colin, & Kerjosse 2002). In 2000, the Handicap-Incapacity-Dependency survey found that 530,000 elderly out of the 12.1 millions of people aged over 60 years were classified in the GIR 1 category (Colin & Coutton, 2000). This data highlights the importance of developing specific tools for evaluating the autonomy of our elders who might be assigned to the same particular category while encountering their own specific difficulties with regard to autonomy.

The ADL scale (Katz et al., 1970) and the IADL questionnaire from Lawton and Brody (1969) assesses respectively the capacity of an individual to perform common ADL (body care, dressing, toileting, transferring, feeding...) and complex IADL (such as using the telephone, shopping, preparing meals, cleaning, washing clothes, using public transport, managing drug intake or a budget...). These tools are widely and frequently

used in clinical practice. . In France, the IADL is even recommended by the National Authority for Health (HAS: Haute Autorité de Santé), an independent public scientific authority with an overall mission of contributing to the regulation of the healthcare system by improving health quality and efficiency. Various studies have also confirmed its reliability and usefulness. For instance,  French PAQUID study (Barberger-Gateau et al., 1999) showed that the degree of dependence as measured by the IADL self-report questionnaire could be a good predictor of the risk of developing dementia. More specifically, cognitive performances assessed by neuropsychological tests appear to be closely linked to the functional autonomy of individuals (Perrig-Chiello et al., 2006; Tomaszewski Farias, Cahn-Weiner, Harvey, Reed, Mungas, & Chui, 2009). More recently, it was also found that attentional, memory, language, and visuospatial capacities correlated with the scores obtained at the IADL questionnaire specifically for telephone usage, drug taking and budget management (Millán-Calenti et al., 2012). However, these assessments are limited mostly to people aged under 80 years (Jekel et al., 2015).

Although the IADL has proved its efficacy, this evaluation of daily life autonomy suffers mainly from the absence of execution in real life context. Indeed, this self-assessment scale is presented in the form of a subjective self-report questionnaire and it requires the individual to be able to estimate his or her own functioning and abilities in using effective strategies when solving a particular task (Juillerat Van der Linden, 2008). Metacognitive monitoring skills, which are demanding in terms of executive functions, are usually impaired in aging (Douchemane, Isingrini, & Souchay, 2007; Souchay, Isingrini, Clarys, Taconnat, & Eustache, 2004). These monitoring capacities are nevertheless particularly involved in various aspects of daily living activities (Buckley, Norton,

Deberard, Welsh-Bohmer, & Tschanz, 2010; Mascherek, Zimprich, Rupprecht, & Lang, 2011; Mol, Boxtel, Willems, & Jolles, 2006). For example, in Alzheimer disease (AD), including the mild stage, patients besides showing a lack of awareness with regard to their deficits (Morris & Mograbi, 2013; Starkstein et al., 1997), also have a tendency to underestimate their deficits in activities of daily living. Moreover, it is also found that patients' cognitive abilities correlate more with information transmitted by caregivers than those given by the patients themselves.

Numerous alternatives to the IADL or to similar self/informant report questionnaires exist. For instance, a variety of performance-based measures have been devised over the past 25 years. These tools consist in presenting examinees with functional tasks in a standardized format. As an illustration, instead of questioning the patient on his or her cooking skills, the latter is required to prepare a meal using a mock kitchen within the hospital compound. However, this method of assessing functional autonomy is generally time consuming and may require a considerable financial investments on certain materials. The Assessment of Motor and Process Skills (AMPS) for example, is one of the best known and widely used standardized assessments which measures the quality of a person's motor and process skill performance through therapist observation of everyday tasks. However, the use of this tool requires attending specific training workshop but for many clinicians, time and money for training are continually reducing to the point of being nonexistent in some areas. Added to this, as noted by Wenborn (2007), it is also difficult for many users to have their employers investing in the updated software of the AMPS. The potential range of barriers to effective implementation of the AMPS have previously been well described by (Chard, 2000, 2004). Finally, like most existing

tools, the AMPS to our knowledge has not yet been implemented for a French speaking population.

Taking into consideration the French context, where the use of IADL is well established despite its various limits as outlined above (Sikkes & Rotrou, 2014) we proposed to create another complementary version of this tool. We took into consideration the main requests of clinicians that is, a tool which does not require a long training, not expensive in implementing and that can be rapidly administered during a consultation.

We thus elaborated the S-IADL (Simulation of Instrumental Activities of Daily Living) which includes similar items to those of the IADL (Lawton & Brody, 1969). However, unlike the IADL, participants are required to simulate the activities and in doing so, this new tool aims at overcoming the limitations of traditional assessments that we have outlined above. This study aims at matching IADL and S-IADL performances for both HE participants and AD patients and to compare their sensitivity and specificity at their optimal cut-off points for the sample investigated.

METHODS

Participants

Eighty-three participants took part in this study: 69 healthy elderly (HE), and 14 Alzheimer Disease patients (AD). All participants were French native speakers, aged between 61 and 90 years old. They could all read, write, and understand correctly.

The 69 HE (including 37 women, 53.62%) were retired volunteers leading active lives. They were all seen at their own houses. HE with previous or current neurological or psychiatric disorders, sensory or motor impairments, and severe cardiac, respiratory or

renal failure were excluded. The 14 AD patients (including 5 women, 35.71%) were recruited from day care centers. All of them previously underwent a complete diagnostic procedure conducted by a physician specialized in geriatrics and met the clinical criteria for probable AD according to the DSM-IV (American Psychiatric Association, 1994). The AD patients were seen in their day care center. They were all fully cooperative and none of them exhibited behavioral disturbances. The following criteria were also considered when selecting AD patients: apart from the AD, no other previous or current neurological or psychiatric disorders, sensory or motor impairments, severe cardiac, respiratory or renal failure. The Mini Mental State Examination (MMSE) (Kalafat, Hugonot-Diener, & Poitrenaud, 2003), the Goldberg's anxiety Scale (Goldberg, Bridges, Duncan-Jones, & Grayson, 1988) and the Beck Depression Inventory (BDI-II) (Beck, Steer, Ball, & Ranieri, 1996) were administered according to standard procedures to all participants. The characteristics of the two groups are shown in table 1.

Insert Table 1 about here

Material

The Instrumental Activities of Daily Living questionnaire (IADL-E), translated in French by Israel and Waintraub (1986), was used (Lawton & Brody, 1969). This questionnaire includes eight questions on people's abilities to use *Telephone*, to perform *Shopping*, to prepare *Meals*, to maintain *Cleaning*, to do *Laundry*, to use *Transport*, to

take *Medications*, and to manage *Budget*. The performance for each subtest of the IADL is estimated from 0 to 4. The total score is thus 32 points.

By referring to the IADL, we developed the S-IADL to simulate various instrumental daily living activities. The 13 activities of the S-IADL are likely to be representative of the those performed by elderly adults (see Table 2 for details): planning a *Day*; making a *Shopping* list; opening *Hours* of shops; using the *Telephone*; paying a bill by *Check*; writing an address on an *Envelope*; planning how to relay point A to point B using a *Bus plan*; handling *Money*; putting away the *Shopping*; *Filling* a Pillbox; Taking *Medications*; managing *Accounts*; and *Household* activities. The performance for each subtest of the S- IADL is estimated from 0 to 4 points and the total score is thus 52 points.

Insert Table 2 about here

To score, the examiner referred to an observation checklist to identify the strategies used, the difficulties encountered and also the strategies devised by the person to cope with these difficulties:

0 point, unaided success: the action has been performed without any help or individual corrects himself or herself alone;

1 point, partial success: the individual performs the action correctly when the examiner reported his or her error;

2 points, help with success: the individual can achieve single action, but he/she succeeds with the help of the examiner;

3 points, failure even with aid: the execution is unsuccessful even with the help of the examiner;

4 points, failure: the execution is impossible or not evaluable.

For the two questionnaires, IADL and S-IADL, the higher the score is, the less the individual is autonomous.

Design

The factors considered in this study corresponded to a 2 (group: HE and AD) x 2 (evaluation: IADL and S-IADL). The first factor was varied among participants and the second one was a within-participants factor.

Procedure

The study was conducted in accordance with the ethical guidelines for research in psychology and with the ethical principles of psychologists and code of conduct. The HE adults were contacted by phone and, after a brief explanation of the theme of the study, an appointment was set up. Each participant was then seen at home by a clinical psychologist. With the aid of an anamnestic questionnaire, a meticulous screening of the HE adults' general medical history was then performed. Concerning the AD patients, they were seen individually at their day care centers by the same clinical psychologist as for the HE adults. In order to enable participants to make an informed decision as to whether or not they wish to participate, they were asked to read and sign a consent form which

stated the purpose of the study, what is expected from them, the length of time, the possibility of withdrawal at any time and also the guaranty of confidentiality and anonymity of personal data. The study was carried out according to the local Ethics Committee for Health Research.

Each participant was proposed, in the same order, the following evaluations: The Mini Mental State Examination (MMSE, Kalafat et al., 2003), the Goldberg's anxiety Scale (Goldberg et al., 1988) and the Beck Depression Inventory (BDI-II, Beck et al., 1961). The IADL was then administered as a self-assessment scale, followed by the S-IADL. The clinical psychologist paid attention to the strategies used by the participants, the difficulties encountered and the palliative solutions that they deployed to overcome these difficulties. Overall, the experimental procedure lasted for about 1h30 and participants were given the possibility to take a break when needed.

RESULTS

Descriptive data (means proportions and standard deviation of the IADL and S-IADL scores) are presented in table 1 and were compared using a Student's 2-sample *t*-tests with 5% as error rate level. Note that the higher the score is the less the individual is autonomous. As expected, HE obtained better performances at both tools (IADL *M* = 30.9; S-IADL *M* = 9.7) than AD patients (IADL *M* = 49.77; S-IADL *M* = 28.71).

The sample of HE adults being younger than the AD patients, an ANCOVA was conducted to control the confounding age factor. Results showed a significant difference in IADL score between the two groups when adjusted for age [$F(1, 82) = 28.52, p < .001$,

$\eta^2 = .26$]. Regarding the estimation of the effect size, the partial eta-square coefficient is large explaining 26 % of the variance. For the S-IADL scores, the ANCOVA revealed that there was also significant difference between the two participant groups when adjusted for age [$F(1, 82) = 13.31, p < .001, \eta^2 = .14$]. Concerning the estimation of the effect size, the partial eta-square coefficient is large explaining 14 % of the variance.

A Receiver Operating Characteristic (ROC) curve analysis was performed to estimate the optimal cut-off value for both questionnaires and to determine the ability of each to discriminate between groups, AD patients and HE adults (see Figure 1). We also compared the performances at both IADL and the S-IADL questionnaires, by evaluating the areas under the curve (AUC). The AUC of the questionnaire was significantly different from the AUC corresponding to a random test. In order to determine their specificity and sensitivity for establishing their cut-off points, we searched for significant differences between the AUCs. We ended our analysis by comparing the sensitivity and specificity of the two questionnaires with their previously established cut-off points. In analyzing our results, we first checked whether the AUC of the two questionnaires was significantly different from the area under the diagonal determined of a random test. Table 3 presents the results of this analysis for the IADL and S-IADL questionnaires. As shown in the table, the test revealed a significant difference from the random area, with a probability of error smaller than 0.1 % ($p < .001$).

 Insert Figure 1 about here

277

278

279

280

281

282

283

284

285

286

287

288

289

290

291

292

293

294

295

296

297

298

299

Insert Table 3 about here

In order to establish the optimal cut-off point of each scale, we analyzed both sensitivity and specificity at each possible cut-off point. The best performance of the IADL in discriminating between HE and AD participants, is reached at the cut-off point of 41.94 (sensitivity = 86; specificity = 91). For the S-IADL, results indicated that the best discriminating performance is reached at the cut-off point of 14.98 (sensitivity = 93; specificity = 81).

DISCUSSION

The IADL is a self-assessment scale and is presented in the form of a subjective self-report questionnaire while the S-IADL, requires an active participation to simulate the same activities as the IADL.

As expected, HE participants were better than AD patients in both the S-IADL and the IADL, even when age (as covariate factor) is adjusted. However, contrary to our expectations, this pattern of results was not significantly different across the two questionnaires. Our results also revealed that both the IADL and S-IADL questionnaires are able to identify AD patients who are likely to encounter difficulties in performing everyday activities. A high discriminative capacity was also found for the two questionnaires. It suggests that, for both HE adults and AD patients, responses at the

IADL and performances at the S-IADL questionnaires were significantly different from what could be obtained at a random test. These two questionnaires have thus a high accuracy in identifying AD patients who might be losing autonomy in everyday activities.

By referring to the accuracy of both questionnaires at their optimum cut-off point, it appeared that the S-IADL has a better sensitivity (93 vs. 86) than the IADL while the IADL bears a better specificity than the S-IADL (91 vs. 81). However, it is difficult at this point to draw any conclusion on these minimal differences. Further researches are needed to confirm results for this preliminary study. If this pattern of results with regard to sensitivity and specificity is real, this would mean that the S-IADL and the IADL are complementary tools which could be privileged depending on the clinician's objectives.

The S-IADL is a first step towards a more ecological way to assess patients' abilities and autonomy in a classical context of evaluation (i.e. without going to the person's home). Although in the present study no major differences were obtained between the classical IADL and the S-IADL, in certain situations it may be worth privileging our new tool. For instance, it may give clinicians the possibility to identify why an activity is difficult to perform, how the person copes with his or her difficulties in order to perform the activity and what can be proposed as specific compensatory strategies.

Poor self-esteem or lack of (or at least not always full) awareness is known to affect cognitive assessment (Agrigoroaei & Lachman, 2011; Soederberg Miller & Lachman, 2000) and can have considerable impacts on daily activities. In the first case, due to low self-esteem or lack of self-confidence, some ageing adults may feel that they are no more able to perform on their own certain daily living activities that they actually can. Inversely


323 in the second case, not knowing that a deficit exists may make problematic the
 324 acceptance of assistances (Cott & Tierney, 2013). Consequently, it is not rare to have a
 325 patient exposed to serious dangers by performing at home, activities that should not be
 326 performed alone. However, it should be noted that a few studies have also shown that
 327 people with dementia may be aware of their own IADL ability (Kiyak, Teri, & Borson, 1994;
 328 Marková et al., 2014; Martyr, Nelis, & Clare, 2014). Awareness literature often focused
 329 on discrepancy scores between self and informant ratings, but failed to take into account
 330 all of the confounding variables influencing the reliability of the informant. For instance;
 331 recent studies show that caregiver burden, informant depression, age and cognitive
 332 status of the patient, are among the many factors associated with rating bias (Martyr et
 333 al., 2014; Sikkes & Rotrou, 2014). ~~By~~

334 With regard to these two issues, the S-IADL can be an appropriate tool since it
 335 does not rely on subjective evaluations of patients and informants but rather places
 336 patients in an active position where they can be exposed to what really they can do or
 337 not,. In the present study, no measure of awareness or self-esteem, was conducted.
 338 However, considering the coherence between the IADL and the S-ADL, it is possible that
 339 overall, our participants have a good awareness of their actual capacities in daily living
 340 activities. Indeed, the AD patients were all at an early stage and did not present a serious
 341 deterioration of their global intellectual capacities (see MMSE score).

342 In the very early stages of AD, a combination of the IADL and the S-IADL might be
 343 useful especially when patients have low self-esteem with regard to their abilities in daily
 344 life activities. In later stages particularly when patients suffer from acute lack of

345 awareness, the S-IADL may be more appropriate in assessing autonomy in everyday life
346 activities.

347 However, further studies need to examine the relations between the degree of
348 awareness or self-esteem with performances at both the IADL (what I think I can do) and
349 the S-IADL (what I can actually do).

350 By using a specific grid, the S-IADL allows clinicians to gather more and multimodal
351 information while patients are performing the actions. They can have a more precise idea
352 of which specific step in the process is a problem and identify strategies which may be
353 effective or not. All the  information, unavailable with questionnaires, should help
354 clinicians not only for diagnosis purposes but also for rehabilitation.

355 Another strength of the S-IADL, is the possibility to adjust items to a particular patient
356 considering his/her actual activities. Besides the 13 activities described here, we can
357 imagine adding gardening or sewing or any other daily activity that the person performs.
358 This flexibility of the S-IADL, is in line with the need to develop personalised care and
359 support for patients.

360 Naturally, there are also some limitations to the S-IADL which must be resolved
361 before proposing it to clinicians. Beside the need to test the S-IADL on a bigger sample,
362 as suggested above we also need to include patients with and without deficit awareness
363 and see whether performances would be different between the IADL and the S-IADL.
364 Most importantly, it will also be necessary to verify that performances of a person with the
365 S-IADL, really reflect his or her abilities in real life. Indeed, one can be in difficulty in daily
366 living activities for various reasons such as cognitive and or motor impairments. Success

or failure in the S-IADL is more likely to rely on the efficiency of cognitive functions and only to some extent on motor abilities, since patients are requested only to simulate the activities. Thus, although confirmation is needed, we can expect that someone who encounters difficulties in performing the S-IADL will also encounter difficulties in cognitively more complex real life situations. However, we will be more prudent in suggesting that a person, who succeeds in the S-IADL, is also able to perform with the same ease daily living activities in real life. Hence, like the various tests at the disposal of clinicians, the S-IADL is only a tool which can give some important indications on one's autonomy in performing daily living activities but is not sufficient on its own. It can be used in complementary with the IADL and a thorough interview of the patient and his or her relatives.

The IADL scale has been widely criticized for being strongly biased towards men since many of the items are based around traditional female gender roles. This potential gender bias of the Lawton IADL Scale has led to the generation of some non-validated adaptations for its application in men (Vergara et al., 2012). Investigating a possible gender effect with the S-IADL is thus of utmost importance prior to its utilization by clinicians. Finally, although the IADL is known to have reasonably good cross-cultural validity (Ng, Niti, Chiam, & Kua, 2006), further researches should also test the cross-cultural applicability of the simulation version across ethnic groups and if possible in conjunction with gender.

Acknowledgments: We would like to thank all participants. Also we are grateful to Camille GAUDET, Marine WALTON, Alexandra BENOIST and Sophia BENQUET, students in

Neuropsychology at Picardie Jules Verne University (Amiens, France) who contributed to data collection

REFERENCES

- American Psychiatric Association (1994) Diagnostic and Statistical Manual of Mental Disorders. 4. Washington, DC: American Psychiatric Association.
- Barberger-Gateau, P., Fabrigoule, C., Helmer, C., Rouch, I., Letenneur, L., & Dartigues, J. F. (1999). Functional impairment in instrumental activities of daily living: an early clinical sign of dementia? *Journal of the American Geriatrics Society*, 47(4), 456–62.
- Beck AT, Steer RA, Ball R, Ranieri W (1996). Comparison of Beck Depression Inventories -IA and -II in psychiatric outpatients. *Journal of Personality Assessment*, 67 (3), 588–97. doi:10.1207/s15327752jpa6703_13

411 Bontout, O., Colin, C. & Kerjosse, R. (2002). Personnes âgées dépendantes et aidants
412 potentiels : une projection à l'horizon 2040. *Direction de la Recherche des Etudes de*
413 *l'Evaluation et des Statistiques (DREES), Etudes et Résultats, 160* (12), 1-11.

414 Buckley, T., Norton, M. C., Deberard, M. S., Welsh-Bohmer, K. A., & Tschanz, J. T.
415 (2010). A brief metacognition questionnaire for the elderly: comparison with
416 cognitive performance and informant ratings the Cache County Study. *International*
417 *Journal of Geriatric Psychiatry, 25* (7), 739–47. doi:10.1002/gps.2416

418 Cavanaugh, J. C., & Blanchard-Fields, F. (2006). *Adult Development and Aging* (5th
419 Ed.), Belmont, CA: Wadsworth/Thomson Learning

420 Chard, G. (2000). An investigation into the use of the Assessment of Motor and Process
421 Skills (AMPS) in clinical practice. *British Journal of Occupational Therapy*.

422 Chard, G. (2004). Implementing the Assessment of Motor and Process Skills (AMPS) in
423 the workplace: A comparison of the experiences of occupational therapists and new
424 graduates. *British Journal of Occupational Therapy, 67*(2), 54–64.
425 doi:10.1177/030802260406700202

426 Colin, C., & Coutton, V. (2000). Le nombre de personnes âgées dépendantes d'après
427 l'enquête Handicap-Incapacités-Dépendance. *Direction de la Recherche des*
428 *Etudes de l'Evaluation et des Statistiques (DREES), Etudes et Résultats, 94*, 1-8.

429 Douchemane, D., Isingrini, M., & Souchay, C. (2007). Vieillesse, fonctions
430 exécutives et métamémoire : dissociation entre le feeling-of-knowing (sentiment de
431 savoir) en mémoire épisodique et en mémoire sémantique. *L'Année Psychologique,*
432 *107*, 597-622.

- 433 Eghbal-Téhérani, S., & Makdessi, Y. (2011). *Les estimations GIR dans les enquêtes*
434 *Handicap-Santé : Méthode de calcul, intérêt et limites d'une estimation en population*
435 *générale. Direction de la recherche, des études, de l'évaluation et des statistiques*
436 *DREES.*
- 437 Goldberg, D., Bridges, K., Duncan-Jones, P., & Grayson, D. (1988). *Detecting anxiety*
438 *and depression in general medical settings. British Medical Journal, 29, 897-899.*
- 439 Hébert, R. (1997). Functional decline in old age. *Canadian Medical Association Journal,*
440 *157(8), 1037–45.*
- 441 Jekel, K., Damian, M., Wattmo, C., Hausner, L., Bullock, R., Connelly, P. J., ... Frölich, L.
442 (2015). Mild cognitive impairment and deficits in instrumental activities of daily living:
443 a systematic review. *Alzheimer's Research & Therapy, 7(1).* doi:10.1186/s13195-
444 015-0099-0
- 445 Juillerat Van der Linden, A.-C. (2008). Démence de type Alzheimer et évaluation des
446 activités de la vie quotidienne. In M. Van der Linden, A.-C. Juillerat Van der Linden,
447 G. Aubin, and D. Le Gall (Eds.), *Neuropsychologie de la Vie Quotidienne* (pp. 41–
448 105). Marseille: Solal.
- 449 Kalafat M, Hugonot-Diener L, & Poitrenaud J. (2003). Standardisation et étalonnage
450 français du « Mini Mental State » (MMS) version GRECO. *La Revue de*
451 *Neuropsychologie, 13 (2), 209-236.*
- 452 Katz, S., Downs, T. D., Cash, H. R., & Grotz, R. C. (1970). Progress in development of
453 the index of ADL. *The Gerontologist, 10(1), 20–30.*
- 454 Kiyak, H. A., Teri, L., & Borson, S. (1994). Physical and functional health assessment in
455 normal aging and in Alzheimer's disease: self-reports vs family reports. *The*

Gerontologist, 34(3), 324–30.

Lawton, M. P., & Brody, E. M. (1969). Assessment of older people: self-maintaining and instrumental activities of daily living. *The Gerontologist*, 9(3), 179–86.

Marková, I. S., Clare, L., Whitaker, C. J., Roth, I., Nelis, S. M., Martyr, A., ... Morris, R. (2014). Phenomena of awareness in dementia: Heterogeneity and its implications. *Consciousness and Cognition*, 25(1), 17–26. doi:10.1016/j.concog.2014.01.008

Martyr, A., Nelis, S. M., & Clare, L. (2014). Predictors of perceived functional ability in early-stage dementia: self-ratings, informant ratings and discrepancy scores.

International Journal of Geriatric Psychiatry, 29(8), 852–862. doi:10.1002/gps.4071

Mascherek, A., Zimprich, D., Rupprecht, R., & Lang, F. R. (2011). What Do Cognitive Complaints in a Sample of Memory Clinic Outpatients Reflect? *The Journal of Gerontopsychology and Geriatric Psychiatry*, 24(4), 187–195. doi:10.1024/1662-9647/a000046

Millán-Calenti, J. C., Tubío, J., Pita-Fernández, S., Rochette, S., Lorenzo, T., & Maseda, A. (2012). Cognitive impairment as predictor of functional dependence in an elderly sample. *Archives of Gerontology and Geriatrics*, 54(1), 197–201. doi:10.1016/j.archger.2011.02.010

Mol, M. E. M., Boxtel, M. P. J. Van, Willems, D., & Jolles, J. (2006). Do subjective memory complaints predict cognitive dysfunction over time? A six-year follow-up of the Maastricht Aging Study, (4), 432–441.

Moore, D. J., Palmer, B. W., Patterson, T. L., & Jeste, D. V. (2007). A review of performance-based measures of functional living skills. *Journal of Psychiatric Research*, 41(1-2), 97–118. doi:10.1016/j.jpsychires.2005.10.008

- 479 Morris, R. G., & Mograbi, D. C. (2013). Anosognosia, autobiographical memory and self-
480 knowledge in Alzheimer's disease. *Cortex*, 49(6), 1553–65.
481 doi:10.1016/j.cortex.2012.09.006
- 482 Ng, T.-P., Niti, M., Chiam, P.-C., & Kua, E.-H. (2006). Physical and cognitive domains of
483 the Instrumental Activities of Daily Living: validation in a multiethnic population of
484 Asian older adults. *The Journals of Gerontology. Series A, Biological Sciences and*
485 *Medical Sciences*, 61(7), 726–735. doi:http://dx.doi.org/10.1093/gerona/61.7.726
- 486 Perrig-Chiello, P., Perrig, W. J., Uebelbacher, A., & Stähelin, H. B. (2006). Impact of
487 physical and psychological resources on functional autonomy in old age. *Psychology,*
488 *Health & Medicine*, 11 (4), 470–82. Doi:10.1080/13548500600726633
- 489 Royall, D.R., Chiodo, L.K., & Polk, M. J. (2000). Correlates of disability among elderly
490 retirees with “subclinical” cognitive impairment. *Journal of Gerontology*, 55 (9), 541-
491 546
- 492 Sikkes, S. A. M., & Rotrou, J. de. (2014). A qualitative review of instrumental activities of
493 daily living in dementia: what's cooking? *Neurodegenerative Disease Management*,
494 4(5), 393–400. doi:10.2217/nmt.14.24
- 495 Souchay, C., Isingrini, M., Clarys, D., Taconnat, L., & Eustache, F. (2004). Executive
496 functioning and judgment-of-learning versus feeling-of-knowing in older adults.
497 *Experimental Aging Research*, 30 (1), 47–62. doi:10.1080/03610730490251478
- 498 Starkstein, S. E., Chemerinski, E., Sabe, L., Kuzis, G., Petracca, G., Tesón, A., &
499 Leiguarda, R. (1997). Prospective longitudinal study of depression and anosognosia
500 in Alzheimer's disease. *The British Journal of Psychiatry: The Journal of Mental*
501 *Science*, 171, 47–52.

502 Tomaszewski Farias, S., Cahn-Weiner D.A., Harvey, D.J., Reed, B.R., Mungas, D., &
 503 Chui, H. (2009). Longitudinal changes in memory and executive functioning are
 504 associated with longitudinal changes in instrumental activities of daily living in older
 505 adults. *The Clinical Neuropsychologist*, 23 (3), 446–61.
 506 doi:10.1080/13854040802360558

507 Vergara, I., Bilbao, A., Orive, M., Garcia-Gutierrez, S., Navarro, G., & Quintana, J. M.
 508 (2012). Validation of the Spanish version of the Lawton IADL Scale for its
 509 application in elderly people. *Health and Quality of Life Outcomes*, 10, 130.
 510 doi:10.1186/1477-7525-10-130

511 Wenborn, J. (2007). Commentary on “A critique of the Assessment of Motor and
 512 Process Skills (AMPS) in mental health practice”. *Mental Health Occupational*
 513 *Therapy*, 12(1), 8–9.

514

Table 1: Characteristics of the two groups of participants with *T*-Test and *p*-value comparisons

	Group		<i>T</i> -test, <i>p</i> value
	AD (<i>N</i> = 14)	HE (<i>N</i> = 69)	
Age	75-90 (<i>M</i> = 84)	61-90 (<i>M</i> = 73)	-
MMSE	23-18; <i>M</i> = 20.14 (1.99)	30-22; <i>M</i> = 27.38 (2.05)	<i>T</i> = 12.31, <i>p</i> < .001
BDI	6 ; 2.21 (1.97)	0-19 ; 4.16 (4.34)	<i>T</i> = 1.63, N. S.
Goldberg	.79 (1.48)	8-0 ; <i>M</i> = 2.04 (2.46)	<i>T</i> = 1.84, N. S.
IADL	65-29 ; <i>M</i> = 49.76 (10.64)	61-26 ; <i>M</i> = 30.9 (7.69)	<i>T</i> = -6.31, <i>p</i> < .001
S-IADL	51–8 ; <i>M</i> = 28.71 (13.49)	61-0; <i>M</i> = 9.7 (9.67)	<i>T</i> = -5.02, <i>p</i> < .001

Range score; Mean and standard deviation for the tests and comparisons between groups of participants (AD for Alzheimer Disease and HE for Healthy Elderly) using *T*-test and *p*-value

523 Table 2: S-IADL items and their description

<i>S-IADL Items</i>		IADL items
<i>1 – Planning a Day</i>	Organize a typical day by matching activities written on labels with a particular time of the day. This item is composed of a board with schedules for a day and 10 labels.	/
<i>2 – Making a Shopping list</i>	Make a list of groceries to buy for a determine number of relatives in order to be able to eat during two days	Shopping
<i>3 – Opening hours of shops</i>	Verify, by referring to three flyers of different shops, whether they are open on Monday at 10:00 o'clock.	Shopping
<i>4 – Using the Telephone</i>	Make a phone call to know the opening hours of the butcher (number in a flyer).	Ability to use telephone
<i>5 – Paying a bill by check</i>	Write a check to pay a phone bill	Ability to Handle Finances
<i>6 – Writing an address on an envelope</i>	Put the check in an envelope, write the address and make a cross at the location provided for the stamp.	/

<i>7– Planning how to relay point A to point B using a bus plan</i>	Be at the post office at 10 o'clock to post the envelope containing the bill. A city map with two bus routes and corresponding schedules is presented. A red dot indicates on the plan where the participant resides. The task consists in choosing the right bus route and the appropriate time.	Mode of Transportation
<i>8 –Handling Money</i>	Give money (8€60) to the baker, using a purse containing different coins and bank notes.	Ability to Handle Finances
<i>9 – Putting away the shopping</i>	Classify various items according to three possible storage places (refrigerator, kitchen cupboard & table). Three boards with the name of the different storage location and their corresponding images are presented to the participant, together with a list of various foods and objects.	Shopping Food Preparation
<i>10 – Filling a pillbox</i>	Using a prescription, the participant is required to fill a pillbox with fake drugs for the week.	Responsibility for own medications
<i>11 – Taking medications</i>	By referring to the pillbox, the participant is asked three times	Responsibility for own medications

	what drugs must be taken at a given day and a specific time.	
<i>12 – Managing accounts</i>	Taking into consideration a cashback ticket, invoices and receipts, the participant is asked to calculate how much money is left on his/her account. A calculator is available for facilitating calculation.	Ability to Handle Finances
<i>13 – Household activities</i>	The participant is asked to determine what household activity relates to the pictures shown. This item consists of two boards depicting 3 types of household chores (cleaning, doing laundry and washing dishes). The participant is also required to match 16 pictures of equipment or objects with these activities.	Housekeeping Laundry

524

525

Table 3: The Area under the ROC curve (AUC) for IADL and S-IADL questionnaire

	AUC	SE	95% CI		<i>p</i>
			Min	Max	
IADL	.92	.038	.84	.99	<i>p</i> < .001
S-IADL	.91	.039	.83	.98	<i>p</i> < .001

SE: Standard Error

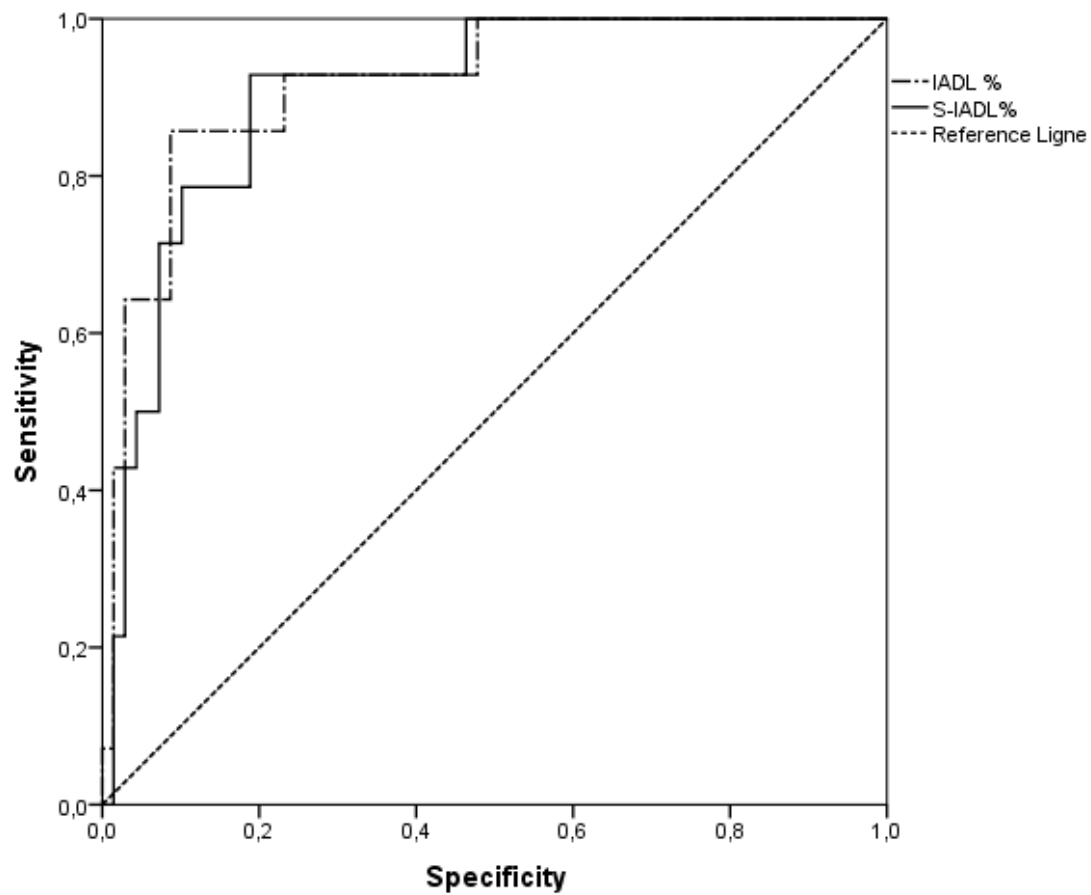
CI: Confidence interval

p: Significance level

544

545

546 Figure 1: ROC Curve



547