Université de Montréal

Évaluation de l'acuité visuelle chez la personne âgée atteinte de troubles de la cognition

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Mémoire présenté à la faculté des études supérieures et post doctorales en vue de l'obtention du grade de Maîtrise en Sciences de la Vision, option sciences fondamentales et appliquées.

Avril 2012

Université de Montréal

Faculté des études supérieures et post doctorales

Ce mémoire intitulé :

«Évaluation de l'acuité visuelle chez la personne âgée atteinte de troubles de la cognition »

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RÉSUMÉ :

Objectif : L'évaluation de l'acuité visuelle (AV) chez la personne âgée atteinte de troubles cognitifs peut être limitée par le manque de collaboration ou les difficultés de communication du patient. Très peu d'études ont examiné l'AV chez les patients atteints de déficits sévères de la cognition. L'objectif de cette étude était d'évaluer l'AV chez la personne âgée vulnérable ayant des troubles cognitifs à l'aide d'échelles variées afin de vérifier leur capacité à répondre à ces échelles.

Méthodes: Trois groupes de 30 sujets chacun ont été recrutés. Le premier groupe était constitué de sujets jeunes (Moy.±ET: 24.9±3.5ans) et le second, de sujets âgés (70.0±4.5ans), ne présentant aucun trouble de la cognition ou de la communication. Le troisième groupe, composé de sujets atteints de démence faible à sévère (85.6±6.9ans), a été recruté au sein des unités de soins de longue durée de l'Institut Universitaire de Gériatrie de Montréal. Le test du Mini-Mental State Examination (MMSE) a été réalisé pour chaque sujet afin de déterminer leur niveau cognitif. L'AV de chaque participant a été mesurée à l'aide de six échelles validées (Snellen, cartes de Teller, ETDRS-lettres,-chiffres,-Patty Pics,-E directionnel) et présentées selon un ordre aléatoire. Des tests non paramétriques ont été utilisés afin de comparer les scores d'AV entre les différentes échelles, après une correction de Bonferroni-Holm pour comparaisons multiples.

Résultats: Le score moyen au MMSE chez les sujets atteints de démence était de 9.8±7.5, alors qu'il était de 17.8±3.7 et 5.2±4.6 respectivement, chez les sujets atteints de démence faible à modérée (MMSE supérieur ou égal à 13; n=11) et sévère (MMSE inférieur à 13; n=19). Tous les sujets des groupes 1 et 2 ont répondu à chacune des échelles. Une grande majorité de sujets avec démence ont répondu à toutes les échelles (n=19) alors qu'un seul sujet n'a répondu à aucune échelle d'AV. Au sein du groupe 3, les échelles d'AV fournissant les scores les plus faibles ont été les cartes de Teller (20/65) et les Patty Pics (20/62), quelque soit le niveau cognitif du sujet, alors que les meilleurs scores d'AV ont été obtenus avec les échelles de Snellen (20/35) et les lettres ETDRS (20/36). Une grande proportion de sujets avec démence sévère ont répondu aux cartes de Teller (n=18) mais le score d'AV obtenu était le plus faible (20/73). Au sein des trois groupes, l'échelle de lettres-ETDRS était la seule dont les scores d'AV ne différaient pas de ceux obtenus avec l'échelle de Snellen traditionnelle.

Conclusions: L'acuité visuelle peut être mesurée chez la personne âgée atteinte de troubles cognitifs ou de la communication. Nos résultats indiquent que les échelles les plus universelles, utilisant des lettres comme optotypes, peuvent être utilisées avec de bons résultats chez les personnes âgées atteintes de démence sévère. Nos résultats suggèrent de plus que la mesure d'acuité visuelle doit être tentée chez toutes les personnes, peu importe leur niveau cognitif.

Mots clés: Acuité visuelle, démence, personnes âgées institutionnalisées, troubles cognitifs, troubles de la communications.

ABSTRACT:

Purpose: The evaluation of visual acuity (VA) in cognitively impaired older individuals may be limited by a reduced ability to cooperate or communicate. To date, no study has been performed to guide the clinician as to which VA chart to use in older individuals with moderate to severe dementia. This is important knowing that dementia affects more than 30% of seniors above 85 yrs of age, many of whom will be affected by the most severe stages of the disease. The objective of this research was to assess VA in older institutionalized individuals with moderate to severe dementia, using various acuity charts, and to verify their ability to respond to each of these charts.

Methods: Three groups of 30 subjects each were recruited. The first group consisted of young subjects (Avg ± SD: 24.9 ± 3.5 yrs) and the second one, older subjects (70.0 ± 4.5 yrs) with no history of cognitive or communication disorders. The third group (85.6 ± 6.9 yrs) included subjects with mild to severe dementia residing in long-term care units. The Mini Mental-State Examination (MMSE) was performed for each institutionalized subject to verify their cognitive level. The VA of each participant was measured using six validated VA charts (Snellen, Teller cards, ETDRS-letters, -numbers, -Patty Pics, -Tumbling E's) presented in random order. Non parametric tests were used to compare VA scores obtained between the various charts, after Bonferroni-Holm corrections for multiple comparisons

Results: The average MMSE scores of subjects with dementia was 9.8 ± 7.5, while it was 17.8 ± 3.7 and 5.2 ± 4.6, for those with mild to moderate (MMSE $\geq$ 13; n= 11) and severe (MMSE < 13; n= 19) dementia. All subjects in groups 1 and 2 responded to each of the charts. A large proportion of subjects with dementia responded to all charts (n= 19) while only one did not respond to any chart. In group 3, VA charts with the lowest scores were the Teller cards (20/65) and Patty Pics (20/62), regardless of the level of dementia, while the best VA scores were obtained with the Snellen (20/35) and ETDRS-letter (20/36) charts. More subjects with severe dementia responded to the Teller cards (n= 18) but the VA obtained was the lowest (20/73). Across all groups, the ETDRS-letter chart was the only one whose scores did not differ from those obtained with the standard Snellen chart. Time to read the letter charts was faster than for the other optotypes.

Conclusions: Visual acuity can be measured, and should at least be attempted, in older cognitively impaired individuals having a reduced ability to communicate. Our results indicate that the most universal scales, using letters as optotypes, can be used with good results in people with more severe dementia. Testing requires, however, more time and encouragement in individuals with more severe cognitive deficits in order to obtain and maintain their collaboration.

Key words: Communication disorder, cognitive deficit, dementia, older institutionalized residents, visual acuity.

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LISTE DES ABRÉVIATIONS :

AV: Acuité visuelle

Avg : Average

CHSLD : Centre d'hébergement et de soins de longue durée

ET : Écart type

ETDRS : Early-treatment diabetic retinopathy study

IUGM: Institut universitaire de gériatrie de Montréal

LogMar: Logarithm of the Minimum Angle of Resolution

LTCF: Long-term care facility

MMSE: Mini-Mental state examination

Min: Minute

Moy: Moyenne

PVVAT ^{TM}: Precision Vision visual acuity testing

SD: Standard deviation

VA: Visual acuity

DÉDICACE :

Je dédicace ce mémoire à ma directrice de recherche, Dre Hélène Kergoat, sans qui ce projet n'aurait jamais vu le jour. Son soutien inconditionnel, sa disponibilité et son savoir-faire ne m'ont jamais fait défaut. Son expérience m'a aidée à acquérir plus de confiance, ce qui m'a permis de progresser dans les différentes étapes de mon parcours. Tout au long de mes études de maîtrise, elle m'a soutenue et encouragée et les mots ne suffiront pas à lui exprimer toute ma gratitude.

REMERCIEMENTS :

Je tiens à remercier tous les participants à l'étude, et plus particulièrement les personnes âgées en soins de longue durée et leur famille, d'avoir accepté de collaborer à ce projet.

Je voudrais également remercier les infirmières et les médecins de l'Institut Universitaire de Gériatrie de Montréal ayant collaboré à l'étude. Leur aide m'a été précieuse lors de la phase de recrutement des participants.

Je tiens à remercier mes collaborateurs au projet : Dre Nathalie Champoux, Dre Marie-Jeanne Kergoat, Dr Bernard-Simon Leclerc et Dre Hélène Kergoat. J'ai eu la chance d'être entourée par cette brillante équipe tout au long de ma maîtrise, ce qui a fortement contribué à la réussite de ce projet.

Je veux également remercier Dr John V. Lovasik et Dre Julie-Andrée Marinier, membres de mon jury, d'avoir accepté de lire et de critiquer mon mémoire.

J'aimerais de plus remercier la fondation Caroline-Durand ainsi que le Fonds de fiducie des optométristes canadiens pour l'éducation pour leur soutien financier tout au long du projet.

Je ne pourrais terminer ces remerciements sans penser à mes chers parents, mon frère, ma sœur, et mon fiancé, dont le soutien et les encouragements m'ont accompagnée tout au long de mes études.

INTRODUCTION

En 2009, 14% de la population canadienne était âgée de 65 ans ou plus, une proportion qui s'élèvera à environ 24% en 2036.[1] En 2008-2009, plus de 155,000 personnes âgées de plus de 65 ans au Canada vivaient en institutions de soins de longue durée, dont environ 40,000 au Québec.[2] Au cours des dernières années, il y a eu réorganisation des services de santé, avec un mouvement vers la communauté, incluant entre autres une augmentation des services ambulatoires et des soins à domicile.[3] Un effet lié à ces changements est que les personnes âgées admises en soins de longue durée sont de plus en plus dépendantes, ont des maladies plus complexes, et davantage de désordres moteurs et sensoriels.[4] Entre 60 et 80% d'entre elles présentent un déficit d'ordre cognitif,[4] ce qui n'est pas surprenant sachant qu'au-delà de 8% de la population canadienne âgée de 65 ans et plus est atteinte de la maladie d'Alzheimer ou d'autres formes de démence.[5] Cette prévalence dépasse les 30% chez les gens âgés de 85 ans ou plus.[5] Le vieillissement de la population canadienne, avec l'augmentation de prévalence de la démence et la complexité des maladies au grand âge, mettra au défi le système de santé et entraînera une nécessaire adaptation de l'offre des soins et services.

Il est préférable que les personnes âgées puissent demeurer chez elles le plus longtemps possible afin de maintenir l'intégrité de leur réseau social, de préserver leurs repères environnementaux, et de pouvoir ainsi profiter d'une meilleure qualité de vie. Malgré cela, la complexité des maladies, la sévérité des

incapacités en découlant, ainsi que la présence de problèmes comportementaux sont autant de facteurs qui conduiront tôt ou tard à leur entrée en institution de soins de longue durée.[6] L'institutionnalisation est souvent davantage liée à la sévérité des incapacités découlant de la maladie qu'à la maladie elle-même. Certaines caractéristiques liées à l'aidant naturel, comme un âge plus avancé, l'épuisement ou la dépression, peuvent aussi conduire à une institutionnalisation plus hâtive de la personne âgée dont on prend soin. [6]

Au Québec, environ 4,7% de la population âgée de 65 ans ou plus réside en Centre d'hébergement et de soins de longue durée (CHSLD). Ce milieu de vie est réservé aux adultes en perte d'autonomie fonctionnelle ou psychosociale qui requièrent 3 heures ou plus de soins pour les aider dans leurs activités de la vie quotidienne. Il s'agit donc de personnes « vulnérables » qui ont besoin d'aide et de soins appropriés pour fonctionner au quotidien. La notion de vulnérabilité chez la personne âgée évolue constamment, mais peut entre autres se définir ainsi « des personnes généralement âgées de plus de 75 ans, qui en raison d'une accumulation de multiples affections chroniques, nécessitent souvent un ou plusieurs services de soutien afin de faire face aux activités de la vie quotidienne ».[7] La vulnérabilité peut donc être considérée comme une fragilité croissante liée au vieillissement.[8] Outre les problèmes de démence mentionnés auparavant, d'autres maladies entraînant des incapacités sévères peuvent aussi donner lieu au placement de la personne âgée en CHSLD, comme les troubles de l'humeur, le syndrome

parkinsonien, l'accident vasculaire cérébral, les maladies vasculaires ou pulmonaires chroniques. La durée moyenne de séjour en CHSLD peut aller jusqu'à 3 ans[9] et constitue souvent le dernier milieu de vie de la personne âgée jusqu'à son décès. Il est donc important d'optimiser les soins et la qualité de vie dans le respect des volontés du patient, exprimées par ce dernier, ou par la personne répondant pour le patient, puisqu'une grande majorité de ces patients ne sont plus aptes à prendre des décisions éclairées quant à leur santé.

Plusieurs maladies affectant la personne âgée peuvent entraîner des troubles de la communication et rendre les examens et interventions visuelles plus difficiles. C'est le cas par exemple pour les troubles sévères de la cognition dans la démence, l'aphasie liée à l'accident vasculaire cérébral, la lenteur/difficulté d'élocution accompagnant parfois la maladie de Parkinson, l'humeur apathique du patient atteint de dépression majeure, les craintes souvent répétées de la personne atteinte de troubles anxieux, la surdité etc. Malgré les difficultés, l'évaluation visuelle est importante car la déficience visuelle est prévalente au sein de la population âgée. À l'échelle mondiale, 285 millions de personnes présentent une déficience visuelle et près de 65% de l'ensemble de ces personnes sont âgées de 50 ans et plus.[10] Au Canada, les données indiquent que 278 000 canadiens sont atteints d'une déficience visuelle, que 108 000 sont légalement aveugles et qu'un canadien sur trois âgé de plus de 75 ans éprouverait un certain niveau d'incapacité visuelle.[11] Par ailleurs, les études indiquent que la déficience visuelle est particulièrement élevée chez les personnes vivant en institution.[12,13] De plus, la prévalence de la déficience visuelle

et de la cécité augmente avec l'âge, quelle que soit l'appartenance ethnique,[14-16] à cause principalement de la dégénérescence maculaire liée à l'âge, du glaucome ou de la cataracte.[14,17] La perte visuelle peut aggraver les problèmes associés à la démence[18] et elle constitue un facteur indépendant contribuant aux troubles du comportement parmi les résidents vivant en institution de soins de longue durée.[19] Une grande partie des déficits visuels chez ces personnes sont dus à des conditions pouvant être traitées comme les erreurs de réfraction non corrigées ou les cataractes.[12,20] Ces conditions doivent être dépistées et traitées lorsque possible. Ces constats sont d'autant plus alarmants sachant que les personnes âgées vivant en institution ne reçoivent pas nécessairement des services oculovisuels adéquats, [21] et que la correction de la réfraction et la chirurgie de cataracte peuvent améliorer considérablement leur qualité de vie tout en diminuant leurs symptômes de dépression.[22-24]

La pertinence d'effectuer une chirurgie de cataracte chez la personne âgée vivant dans la communauté est bien documentée. Les bénéfices de la chirurgie de cataracte chez les personnes âgées vivant en institution et n'ayant pas de troubles cognitifs importants ont aussi été démontrés.[24] Malgré cela, la chirurgie de cataracte n'est pas nécessairement effectuée de routine chez les personnes âgées institutionnalisées. Une étude indique effectivement que la chirurgie de cataracte est moins bien acceptée chez les gens vivant en soins de longue durée. Cette étude rapporte que les personnes âgées ayant un déficit cognitif sont moins à même de

prévenir leur entourage de leurs problèmes visuels, que leurs aidants naturels sont plus réfractaires aux procédures chirurgicales, que les bénéfices de la chirurgie peuvent sembler moins évidents et qu'il est plus difficile de tester leur vision.[25] L'évaluation subjective de l'acuité visuelle peut représenter un défi au sein d'une population institutionnalisée qui présente des troubles importants de la cognition ou de la communication, et le jugement clinique doit parfois être utilisé pour définir l'acuité visuelle approximative du patient.[26] Malgré cela, une étude clinique rétrospective a démontré qu'il était possible de réaliser un examen visuel complet chez les personnes âgées vivant en institution, indépendamment de l'âge avancé, du statut cognitif et des troubles de la communication.[17] De plus, l'acuité visuelle était préservée à un âge avancé dans l'œil non atteint de pathologie oculaire.[17] Cette étude suggère donc qu'il est possible d'évaluer ces personnes âgées, mais que l'approche clinique doit être adaptée afin de maximiser l'information obtenue dans le cadre de l'examen visuel.

Une autre problématique ciblant particulièrement la personne âgée et où la vision peut jouer un rôle important est la chute.[27] Les chutes constituent effectivement un problème de santé majeur sachant que 30 % des personnes âgées de 65 ans et plus font au moins une chute par année,[28] que cette proportion atteint 50% chez les plus de 85 ans vivant à la maison[29] et qu'elle est encore plus élevée chez les personnes âgées vivant en institution.[30] De plus, 5% des personnes âgées qui chutent doivent être hospitalisées.[31] Au Québec, les chutes donnant lieu à un

traumatisme représentent 10 à 15% des admissions en unités de courte durée gériatrique.[32] Les chutes sont d'origine multifactorielle.[33] La déficience visuelle a maintes fois été citée comme étant un facteur de risque de chute et de fracture chez la personne âgée.[34] Plusieurs études, entre autres, ont démontré qu'une diminution d'acuité visuelle représentait un risque indépendant de chute chez la personne âgée,[34-36] même si cela n'est pas universellement accepté.[37,38] L'évaluation de la vision chez la personne âgée ayant chuté est donc importante et devrait être systématique,[33] bien que ce ne soit pas le cas actuellement.[39] Les études indiquent, entre autres, que la diminution d'acuité visuelle, la perte de sensibilité aux contrastes, la diminution de vision stéréoscopique et la perte de champ visuel peuvent augmenter le risque de chute chez la personne âgée.[40-43] La chirurgie de cataracte diminue les risques de chute et de fracture,[44] de même que les blessures.[45] Un essai clinique randomisé a également démontré que la chirurgie de cataracte du premier œil chez la femme âgée diminuait les risques de chute et de fracture, de même que l'anxiété et la dépression, tout en améliorant l'acuité visuelle et la sensibilité aux contrastes.[46] La chirurgie de cataracte du deuxième œil au sein de cette même population était associée à une amélioration de la fonction visuelle ainsi qu'à une diminution de la crainte de chuter et du niveau de handicap.[47] Malgré les résultats obtenus dans ces études, il n'y a pas encore suffisamment d'évidence pour indiquer de façon non équivoque que la chirurgie de cataracte diminue les chutes chez les personnes âgées.[48] Il demeure toutefois important d'évaluer la vision chez la personne âgée ayant chuté ou à risque de chute, et de l'optimiser

chaque fois que cela est possible, que ce soit par traitement optique, médical, chirurgical ou par réadaptation visuelle.[49]

L'acuité visuelle correspond à la capacité de résolution spatiale de l'œil et se mesure cliniquement en identifiant l'angle sous-tendu à l'œil par le plus petit optotype reconnaissable. L'outil standard de prise d'acuité visuelle au sein de la population générale demeure l'échelle de Snellen traditionnelle, constituée de lettres ou optotypes à contraste élevé diminuant en grandeur de haut en bas de l'échelle.[50] En présence de personnes âgées ayant des troubles importants de la cognition, altérant la compréhension de consignes et la communication, il n'est pas toujours possible de mesurer l'acuité visuelle avec l'échelle de Snellen. Il en est de même pour d'autres populations cliniques, et au fil des ans, de nouvelles échelles de mesure de l'acuité visuelle ont été élaborées pour répondre à des besoins particuliers. L'échelle logarithmique, dont la progression de la hauteur des lettres d'une ligne à l'autre est géométrique,[51] offre une mesure plus standardisée de l'acuité visuelle et son utilisation est privilégiée dans l'évaluation des patients en basse vision[52] et dans les études épidémiologiques.[53] L'échelle des symboles de Lea a été conçue pour mesurer l'acuité visuelle chez les enfants de 3 à 5 ans,[54] et structurée de telle sorte que l'enfant puisse répondre soit en pointant ou en nommant des symboles faciles à identifier à cet âge.[55] La méthode du regard préférentiel a été élaborée afin de tester des personnes atteintes de handicap intellectuel.[56] Il s'agit d'une technique comportementale basée sur le principe qu'en

présence de deux cibles, l'une formée d'un réseau de lignes noires et blanches, l'autre formée d'une plage grise uniforme, une personne préfèrera regarder le réseau.[57,58] La personne continuera à préférer le réseau, lors de la présentation de cibles successives comportant une plage grise et un réseau où la fréquence spatiale des lignes noires et blanches est augmentée, tant qu'elle sera en mesure de discriminer les lignes.

Aucune échelle d'acuité visuelle à ce jour n'a été développée spécifiquement pour la personne âgée atteinte de déficits sévères de la cognition ou de troubles importants de la communication. La méthode du regard préférentiel (cartes de Teller) aurait par contre été utilisée avec succès cliniquement chez un groupe restreint de personnes âgées en soins de longue durée ayant des problèmes de communication[59] et des déficits cognitifs modérés.[60] Par ailleurs, dans le cadre d'une étude effectuée en soins de longue durée, des chercheurs ont démontré que l'acuité visuelle pouvait être testée chez 84% des résidents à l'aide des cartes de Teller, contre 74% des participants lorsque l'échelle ETDRS ou Lea était utilisée.[61] Il est important de souligner, par contre, que cette étude incluait uniquement des gens ayant un déficit cognitif léger à modéré, les chercheurs ayant exclus d'emblée les résidents ayant un déficit cognitif plus sévère.

Les études présentées dans ce manuscrit démontrent qu'il est important d'évaluer la fonction visuelle[12,21] et la santé oculaire[14,20] chez la personne âgée,

d'autant plus que la pathologie oculaire et la perte visuelle présentent une prévalence accrue avec l'âge. De plus, une bonne afférence visuelle est un facteur jouant un rôle important dans la qualité de vie de la personne âgée[22-24] alors que la perte visuelle peut contribuer à l'anxiété,[62] à la dépression,[63] à l'isolement,[62] aux troubles de comportement[19] et aux chutes.[34,35] Ces phénomènes s'aggravent chez la personne âgée vivant en institution,[12,13] car elles sont plus vulnérables du fait de leur état de santé fragile et de leur perte d'autonomie.[6] Les troubles cognitifs qui affectent une large portion de ces personnes peuvent diminuer leur capacité à exprimer leurs besoins et leurs difficultés le cas échéant.[25] L'évaluation de leur santé, incluant les soins oculovisuels, est souvent plus difficile, doit être adaptée pour les besoins spécifiques de cette population et demande un peu plus de temps.[17] Ces personnes peuvent aussi avoir de la difficulté à communiquer et à collaborer lors de l'examen visuel, ce qui peut affecter une mesure aussi simple mais tellement importante que l'acuité visuelle.[64]

Il n'existe pas d'échelle « universelle » permettant de mesurer l'acuité visuelle chez les personnes âgées vulnérables ayant de la difficulté à communiquer ou à collaborer. Dans un cadre clinique, la prise d'acuité visuelle se déroule souvent en présentant les diverses échelles de mesure existantes une à la suite de l'autre, jusqu'à ce que l'une d'entre elles attire suffisamment l'attention du patient pour lui permettre de collaborer. Il n'existe aucune étude à ce jour pour guider le clinicien. Il serait donc important de savoir s'il existe une échelle supérieure aux

autres pour mesurer adéquatement l'acuité visuelle chez les personnes âgées vulnérables, ou encore s'il est possible d'optimiser leur ordre de présentation, afin d'accélérer l'examen visuel tout en minimisant le degré de fatigue chez le patient. L'étude présentée dans le chapitre suivant tente de répondre à cette problématique.

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Visual acuity in older institutionalized seniors with moderate to severe cognitive deficits

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Abstract:

Purpose: The evaluation of visual acuity (VA) in cognitively impaired older individuals may be limited by a reduced ability to cooperate or communicate. To date, no study has been performed to guide the clinician as to which VA chart to use in older individuals with moderate to severe dementia. This is important knowing that dementia affects more than 30% of seniors above 85 yrs of age, many of whom will be affected by the most severe stages of the disease. The objective of this research was to assess VA in older institutionalized individuals with moderate to severe dementia, using various acuity charts, and to verify their ability to respond to each of these charts.

Methods: Three groups of 30 subjects each were recruited. The first group consisted of young subjects (Avg ± SD: 24.9 ± 3.5 yrs) and the second one, older subjects (70.0 ± 4.5 yrs) with no history of cognitive or communication disorders. The third group (85.6 ± 6.9 yrs) included subjects with mild to severe dementia residing in long-term care units. The Mini Mental-State Examination (MMSE) was performed for each institutionalized subject to verify their cognitive level. The VA of each participant was measured using six validated VA charts (Snellen, Teller cards, ETDRS-letters, -numbers, -Patty Pics, -Tumbling E's) presented in random order. Non parametric tests were used to compare VA scores obtained between the various charts, after Bonferroni-Holm corrections for multiple comparisons

Results: The average MMSE scores of subjects with dementia was 9.8 ± 7.5, while it was 17.8 ± 3.7 and 5.2 ± 4.6, for those with mild to moderate (MMSE ≥ 13; n= 11) and severe (MMSE < 13; n= 19) dementia. All subjects in groups 1 and 2 responded to each of the charts. A large proportion of subjects with dementia responded to all charts (n= 19) while only one did not respond to any chart. In group 3, VA charts with the lowest scores were the Teller cards (20/65) and Patty Pics (20/62), regardless of the level of dementia, while the best VA scores were obtained with the Snellen (20/35) and ETDRS-letter (20/36) charts. More subjects with severe dementia responded to the Teller cards (n= 18) but the VA obtained was the lowest (20/73). Across all groups, the ETDRS-letter chart was the only one whose scores did not differ from those obtained with the standard Snellen chart. Time to read the letter charts was faster than for the other optotypes.

Conclusions: Visual acuity can be measured, and should at least be attempted, in older cognitively impaired individuals having a reduced ability to communicate. Our results indicate that the most universal scales, using letters as optotypes, can be used with good results in people with more severe dementia. Testing requires, however, more time and encouragement in individuals with more severe cognitive deficits in order to obtain and maintain their collaboration.

Key words: Communication disorder, cognitive deficit, dementia, older institutionalized residents, visual acuity.

Introduction:

The population of seniors 65 years of age and older is presently about 13.5% in Canada and the United States and is projected to be some 20-24% around 2035.[1,2] Similar statistics are found in many other developed countries.[3] This aging of the population is further characterized by a faster growth rate of individuals 75 years of age and older and an increase in the prevalence of chronic diseases causing significant morbidity and mortality.[4] Many older individuals affected by chronic diseases will eventually be institutionalized due to a decrease in autonomy and increase in care needed by their condition. Nowadays, older people admitted to nursing homes are more dependent, have more complex diseases, and suffer more motor and sensory disorders.[5] Furthermore, 60 to 80% of them have a cognitive deficit, which is not surprising knowing that 8% of the general population 65 years of age and older, and 33% of those 85 years of age and older, suffer from dementia.[4,6]

Visual impairment and blindness due to conditions such as age-related macular degeneration, glaucoma or cataracts are very prevalent in older individuals[7] especially those living in nursing homes.[8,9] Studies have shown, however, that most visual deficits in nursing home residents are due to treatable conditions such as uncorrected refractive errors or cataracts[8,10] and constitute an important cause of correctable legal blindness.[11] All these conditions must be screened and treated whenever possible knowing that improving vision enhances quality of life and reduces depression in older seniors living in nursing homes.[12-14] This is even more

critical knowing that visual impairment is a risk factor for cognitive decline[15-17] that it can exacerbate the problems associated with dementia[18,19], and that it is an independent factor contributing to disruptive behavior among nursing home residents.[20] Unfortunately, it has also been reported that nursing home residents do not receive appropriate visual care.[21]

A major difficulty in older nursing home residents suffering from chronic diseases such as severe dementia or aphasia resides in their impaired ability to express their symptoms or needs and to collaborate during the eye examination. Evaluating visual acuity (VA) may be particularly challenging but is very important to assess refraction, diagnose disease and its progression or for visual rehabilitation. Although it has been shown that VA can be measured in these individuals,[22] no acuity chart has been developed specifically for these patients as has been done with other populations. For example, the logarithmic-type acuity charts have been developed for low vision patients[23, 24] and are also used in epidemiological studies.[25] The Lea symbols were designed to measure VA in children 3 to 5 years of age.[26] The preferential looking method was developed to measure VA in people with intellectual disabilities.[27]. Although preferential looking has been used clinically to quantify VA in institutionalized older people with mild to moderate communication or cognitive deficits, it was done in a limited number of patients.[28, 29] Preferential looking has also been shown to provide better VA results in a research setting comparing grating *vs* recognition acuity in nursing home participants.[30]

No study, however, has investigated in a systematic fashion the ability of older nursing home residents with moderate to severe cognitive and communication deficits to respond to the various acuity charts used in the clinical setting. This would help determine if they have the ability to respond better to a given chart and if the level of VA obtained differs between charts. Optimizing vision is particularly important for an aging institutionalized population where dementia and visual impairment are so prevalent, and often co-exist, which may place them at higher risk of negative events such as depression,[31] isolation,[32] behavioral problems[20] and falls/fractures.[33-36] Furthermore, these individuals are often not able to advocate for themselves or express their symptoms.

Our objective was to evaluate VA in a population of nursing home residents with moderate to severe cognitive and communication deficits to verify their ability to respond to various charts and the level of VA obtained, in comparison to the traditional Snellen chart widely used in clinic.

METHODS:

Hospital setting:

The study was conducted at the Institut Universitaire de Gériatrie de Montréal (IUGM) a tertiary care hospital affiliated with the University of Montreal. The IUGM is a 452 bed-integrated geriatric center with acute, sub-acute, long-term care and outpatient clinics. There are 254 beds reserved for the various long-term care

facilities (LTCF) within the IUGM.

Participants:

Thirty competent and incompetent residents (Mean age ± SD: 85.6 ± 6.9 yrs) from the various IUGM LTCFs were recruited to participate in the study. To be eligible, a participant had to be 65 years of age or older and to have an age-related cognitive deficit. Exclusion criteria were severe disruptive behaviour, extreme fatigue or weakness, non responsive to any form of stimulation and a terminally ill condition. Ocular pathology was not a criterion since the study goal was to compare the VA obtained between the various charts. However, people with a VA of less than 20/70 in the better eye after ocular refraction were excluded, to increase our capacity of refining the VA level measured. The recruitment was facilitated by the collaboration of physicians and nurses taking care of the patients in the various LTCFs of the IUGM who were responsible for identifying patients potentially meeting the inclusion/exclusion criteria for the study. The project was approved by the Research Ethics Committee of the IUGM. All aspects of the study were explained to the resident and a close family member or legal representative, and they were able to ask any questions they had before deciding on participation into the study, without prejudice. The signed free and informed consent of each participant and their family member or legal representative (attorney, guardian or trustee) was obtained prior to participation to the study.

In addition, one group of young adults (Group 1; n = 30, mean age ± SD: 24.9 ±

3.5) and one group of community-dwelling older adults (Group 2; *n* = 30, mean age ± SD: 70.0 ± 4.5) were asked to participate to the study before recruiting the LTCF residents (Group 3) described above. These 2 groups were included for 2 reasons: 1) to verify if the acuity level measured with letters presented on a computer screen was similar to the one measured with letters projected on the wall, and 2) to verify the level of VA obtained in young and older participants with the various acuity charts to be used in our group of participants with cognitive deficits. These participants were recruited from the Clinique universitaire de la vision de l'Université de Montréal, an eyecare clinic open to the public, within one week of having passed a complete eye examination. They were eligible to the study if they had 20/20 vision, no ocular pathology or neurodegenerative disease and agreed to participation in the study. The absence of ocular pathology was a criterion for these 2 groups in order to know what was the best VA measurable with the various charts. These participants also received all the information required before signing the free and informed consent.

Testing:

All testing took place at the eyecare clinic of the IUGM, an examination room equipped with state-of-the-art ophthalmic equipment and adapted for the special needs of older institutionalized patients. The day and time of each session was scheduled to best suit the needs of the participant and his/her caregiver. The testing was performed with the participant sitting in the ophthalmic chair. If this was not possible, the participant remained in his/her wheelchair that was positioned at the

location of the ophthalmic chair after this latter had been slid back on its footplate, so that the test distance remained relatively similar for all participants. For young and older adults in groups 1 and 2, VA was measured with the participant sitting in the ophthalmic chair after proper calibration of the various charts had been done.

For the older institutionalized participants with moderate to severe cognitive deficits, testing started with an evaluation of the Mini-Mental State Examination (MMSE).[37] The MMSE was conducted on the day of experimentation to obtain an index of the cognitive level of the participant. However, if the attending physician had carried out this test in the six month period preceding experimentation, this MMSE score was used and extracted from the medical record.

A subjective ocular refraction for distance vision was then performed, using the traditional Snellen VA chart. For those in whom the subjective ocular refraction was not possible, the results of an electronic auto-refractometer were used. Visual acuity was then measured through the subjective or objective refraction in a trial frame or with the participant's glasses as indicated by the refraction. The tested VA charts were presented to the participants in random order[38] as determined by the Winpepi software.[39,40] Thirty randomization assignments had been performed in advance and each was used successively from 1 to 30 in the order the participants were recruited to the study.

The VA charts tested in this study were: Snellen, tumbling E, Patty Pics symbols,

ETDRS, numbers, and preferential looking (Teller cards). All charts, with the exception of the Snellen chart and Teller cards, were displayed in logarithmic format on a Macintosh computer screen, using the PVVAT™ software (Precision Vision; Illinois; USA). The Snellen chart was projected on a regular wall-mounted screen. A commercially available Bosh DLR 130-laser distance measurer was used to measure the distance between the participant and the acuity chart, in order to calibrate each chart prior to the VA measurements. This distance was entered in the computer and the PVVAT™ software provided feedback on the size adjustment to be made to a calibration box appearing on the screen to ensure proper calibration of the optotypes for the test distance. The projector for the Snellen chart was adjusted manually if required. For the Teller cards, a meter stick was used to ensure that the 84 cm distance from the participant's ocular refraction plane to the card was respected throughout testing. A light was directed towards the card to ensure good contrast while avoiding glare. The contrast on the Snellen and logarithmic charts was ≥ 98%. The lights in the room were turned on throughout testing.

In order to reduce testing time and minimize fatigue, only the eye with best VA was tested in each participant. An explanation of what was expected with each chart was provided to the participant before the VA was measured with the chart. The optotypes were presented line by line or one by one according to the attention span of each participant. For each test, except the Teller cards, each acuity chart was started by presenting optotypes one to two lines above the best VA level measured during the ocular refraction, in order to accelerate the test and decrease

fatigue. Participants were allowed to either name the optotypes or match them with similar optotypes presented on a card at 40 cm. For the Teller cards, the decision as to whether or not the participant could see the grating was based on a variety of cues including fixation, pointing and/or verbalization. The participants could either look in the direction of the gratings, point towards the gratings or tell their location (right or left). During testing, the cards were placed face down in a stack. The left-right position of the grating was variable across cards so that neither the experimenter nor the participant knew where the grating would be located on the next card. Testing began by showing the participant a relatively coarse grating, known as the start card, and then presenting the blank card. Presenting these two cards helped inform the experimenter on the behavior of the participant when gratings could and could not be seen. The acuity cards were then presented in descending order, beginning with a coarse grating and moving down sequentially toward finer gratings. When gratings close to the acuity limit were presented, these cards were shown to the patients several times, again without the experimenter knowing the location of the gratings. The VA cut-off was determined after two bad responses were obtained on a given card and recorded as the VA corresponding to the one on the card just above. The response was determined mainly by the experimenter holding the card and looking through a central hole at the direction of the subject's eyes. This was very often complemented by the subject verbalizing that the grating was seen to their right or left, or a clear indication of the subject pointing in the direction of the grating. For all charts, encouragements were offered to participants throughout the test session. Regular breaks or additional test

sessions were provided whenever necessary to minimize fatigue. A remote control was used to change the optotypes or to alternate between charts when the PVVAT™ system was used. Testing time and VA were recorded for each chart.

For participants in groups 1 and 2, VA was measured in one randomly chosen eye, with the optimal refraction in place, as determined by the results of their recent eye examination. A single test session was required to test the six acuity charts. A pre-determined randomization assignment for VA chart presentation had also been performed prior to testing for each of these 2 groups. Testing time was quick for each chart and not recorded.

Statistical analysis:

Best VA obtained for each chart was recorded for each participant. All VA measurements were recorded in logarithmic values to facilitate data analyses. Time taken to perform each VA chart was recorded in minutes for each participant in group 3. Average and standard deviation (SD) values were computed for the level of VA measured with each chart within groups. Similar descriptive statistics were done for time taken to perform each acuity chart in group 3. Non parametric tests were used given the small sample size and the asymmetry of the distribution. Friedman, and Wilcoxon matched-pairs, rank sum tests were performed to verify if VA results differed between charts. Similar statistics were done for time taken to perform each acuity chart in group 3. Kruskal-Wallis H tests and Mann-Whitney U tests were performed to verify if the number of VA charts read as well as time

taken to perform each acuity chart were different between groups, and between the 2 MMSE sub-groups for group 3. Friedman tests were performed to verify if the order in which the VA charts were presented had an influence on the results obtained. A level of alpha = 0.05 was used for statistical significance, after Bonferroni-Holm adjustment of *p*-values for multiple comparisons. All statistics were calculated using SPSS (SPSS for Windows, version 19).

RESULTS:

Mini-Mental State Examination:

The MMSE for participants in group 3 ranged from 0 to 23 with a mean and SD of 9.8 ±7.5. This group was further divided into two subgroups based on a MMSE score of 13 as is often done in clinical research involving nursing home residents:[8,13,14,41] participants with mild to moderate cognitive deficits having a MMSE score ≥ 13 (*n*= 11; mean MMSE score ± SD: 17.8 ± 3.7), and participants with more severe cognitive deficits having a MMSE score < 13 (*n*= 19; mean MMSE score ± SD: 5.2 ± 4.6).

Overall visual acuity results:

Young and community-dwelling older participants from groups 1 and 2 respectively responded to all charts, which was not the case for participants with dementia. A significantly lower number of VA charts could be administered to participants in group 3 compared to those in groups 1 and 2 ($p \leq 0.05$). In group 3, 80% of the participants (*n*= 24) responded to the Snellen chart, 97% (*n*= 29) to the

Teller cards, 87% (*n*= 26) to the numbers, 90% (*n*= 27) to the ETDRS letters, 70% (*n*= 21) to the Tumbling E, and 77% (*n*= 23) to the Patty Pics. A large proportion (63%) of participants with dementia (*n*= 19) were able to respond to all charts while only one participant could not respond to any chart. A summary of the results is presented in Table 1.

In the group of participants with dementia, charts with statistically lowest VA scores ($p \leq 0.05$) were the Teller cards (20/65) and the Patty Pics (20/62), regardless of the level of dementia, compared to the other charts: 20/35 with the Snellen chart, 20/39 with numbers, 20/36 with ETDRS letters and 20/38 with the Tumbling E chart. Considering the participants (*n*= 19) who were able to respond to all the charts, the best VA scores were obtained with the Snellen (20/32) and ETDRS letter (20/31) charts while the lowest VA scores were obtained with the Teller cards and the Patty Pics (20/55), regardless of the level of dementia. The VA obtained with the numbers and Tumbling E was 20/36.

The ETDRS letter chart was the only one for which the VA scores obtained did not statistically ($p > 0.05$) differ from the standard Snellen chart for all groups tested. Indeed, in the group of young participants, the VA was 20/15 for Snellen and ETDRS, and the VA was 20/17 for both charts in the group of older participants. In the third group of older participants with dementia, VA was 20/35 for the Snellen chart and 20/36 for the ETDRS letter chart.

Visual acuity results *vs* MMSE:

In group 3, participants with more severe dementia (MMSE< 13) responded to a significantly lower number of VA charts than participants with mild to moderate dementia (MMSE≥ 13) ($p \leq 0.05$). In the subgroup of participants with a MMSE < 13, more responded to the Teller cards (94.7%, n= 18), but the level of VA obtained was the lowest (20/73) among all charts tested. The VA obtained for the Snellen chart was significantly different ($p \leq 0.05$) from the Tumbling E, Patty Pics and Teller cards, but not the ETDRS letters and numbers. Overall, the best VA scores were obtained for the Snellen chart (20/38), ETDRS letters (20/39) and numbers (20/39). In this subgroup, when comparing the VA obtained with the Snellen chart to each of the other charts among participants able to answer to both the Snellen and the other chart, the same 14 participants were able to respond to the Snellen (20/38), the ETDRS (20/36) and the number (20/39) charts as well as to the Teller cards (20/66). Eleven participants responded to both the Snellen (20/31) and the Tumbling E (20/44), and 10 participants responded to both the Snellen (20/33) and the Patty Pics (20/62).

In the subgroup of participants with a MMSE ≥ 13, all participants (n= 11) responded to the following charts: Teller cards (20/51), numbers (20/38), ETDRS (20/33) and Patty Pics (20/58), and 10 participants responded to the Snellen (20/31) and Tumbling E (20/33) charts. Overall, the best VA scores were obtained for the Snellen, ETDRS and Tumbling E charts, while the lowest VA scores were obtained with the Teller cards and the Patty Pics.

Time measurement:

For participants in group 3, the average time taken for measuring the VA was statistically ($p \leq 0.05$) shorter for the Snellen chart than for the Patty Pics and the Teller cards. The mean reading time for the letter charts (Snellen and ETDRS letters) was 4.3 ± 0.4 min *vs* 6.5 ± 0.7 min for the other charts in group 3. The mean reading time for all charts in participants with a MMSE < 13 *vs* MMSE ≥ 13 was 6.6 ± 1.4 min *vs* 4.6 ± 1.1 min.

Order of presentation:

As indicated earlier, all charts were presented to the participants in a random pre-established sequence. However, an analysis was still performed to verify if the order in which the charts were presented had an influence on the VA obtained. It was shown that the order of presentation did not influence the VA obtained with the various charts in any of the 3 study groups or sub-groups for group 3 ($p > 0.05$).

DISCUSSION:

In this study, a group of young adults and a group of community-dwelling older participants with no cognitive or communication disorders were included for two reasons. First, to verify if the acuity level measured with letters presented on the luminous background of a computer screen was similar to the one obtained with letters projected on the wall. The within-group acuity results obtained with the projected Snellen chart and the computer-based ETDRS letter scale were similar, indicating that the two methods of presentation were similar in terms of clinical

measure of visual acuity. The second reason to include these two study-groups was to verify the level of visual acuity obtained in young and older participants with the various acuity charts to be used in our group of participants with dementia. The VA scores obtained varied from 20/13 to 20/17 and from 20/17 to 20/23 in young and old participants, respectively. Within-group statistical comparisons of all paired-chart permutations showed that most of the time, these scores were different between charts, more so in the young participants. In the group of older participants with no cognitive or communication disorders, the highest visual acuity scores were obtained with the Snellen and ETDRS letter charts and the worse visual acuity scores were obtained with the Teller cards and the Patty Pics. The same trend was observed for the group of participants with dementia. This emphasizes the fact that clinically, it is important to always measure the visual acuity with the same chart for a given patient, and to record the name of the chart used, since the various charts don't necessarily provide the same level of visual acuity. The visual acuity scores measured in people with dementia were lower (20/35 to 20/65) than in the other participants without dementia. However, no conclusion can be drawn from this observation, because the presence of eye disease was not part of the inclusion / exclusion criteria for people with dementia, since the objective was to compare the VA obtained between charts.

The results showed that it was possible to measure visual acuity for all but one participant with dementia. Moreover, the visual acuity scores were generally higher and faster to obtain with scales presenting letters as optotypes. While the

alternative scales were still suitable for measuring visual acuity, they did not always achieve the same level of visual acuity. For example, visual acuity with the Teller cards could be measured in a larger proportion of participants with dementia, but the visual acuity scores were worse than those measured with traditional letters. On average, there was a 0.24 logMar difference in the acuity measured with the Teller cards and the ETDRS letter chart.

The results showed that in the group of participants with dementia, the Teller cards and the Patty Pics gave the lowest VA scores, regardless of the level of dementia. The highest VA scores were obtained for the Snellen chart as well as the ETDRS letters and numbers. There are several possible reasons for these results. First, letters and numbers are well known optotypes while the Teller cards and the Patty Pics were likely new to the participants and seen for the first time in this context. In participants with increasing dementia, attention span and learning ability may be reduced.[42] There is some evidence that the deficits in episodic memory that affect individuals with Alzheimer's disease can be attributed to a difficulty in the learning process, i.e. encoding and storage of information, rather than the retrieval of information.[43] Studies have shown that individuals with Alzheimer's disease performed significantly worse on tests of visual attention and visual memory.[44,45] It is also known that other forms of dementia, such as Parkinson's disease dementia and dementia with Lewy bodies, are associated with profound visuoperceptual impairment.[46] It is well established that not all aspects of memory are affected equally in early Alzheimer's disease. The typical early presentation of Alzheimer's

disease is short-term memory dysfunction rather than long-term memory deficit.[47] Furthermore, the major impairment is in the domain of anterograde episodic memory. The inability to retain new information, such as a story or word-list, is a sensitive measure of early disease.[48-50] Letters and numbers are typically learned early in life and retrieved from an individual's long-term memory. This may explain why participants with dementia fared better with charts displaying letters and numbers compared to other charts. It does not mean that their resolution is higher with this type of optotype, but rather that they were able to express more easily what they saw. Hence, it may have been possible to measure a better resolution, i.e. visual acuity level, with these optotypes because the participants had learned them early in life and could recognize them. In addition, time to read the letter charts (Snellen or ETDRS) was faster than for the other optotypes. This can be explained by the ease to name the letters, involving the long-term memory, compared to the symbols that were presented to the participants for the first time on the day of testing.

Visual acuity with the Teller cards could be measured in a larger proportion of participants with dementia, regardless of severity. Three hypotheses could explain this result. First, the Teller cards were tested at a closer distance than the other visual acuity charts, which may have increased the attention of the participants to the test, so that they could at least provide a certain acuity level. Second, the basis of preferential looking relies on the fact that a person will prefer to look at an area containing a target rather than a uniform pictureless grey area.[51,52] This preference

may be retained inspite of the cognitive deficit, again allowing for a certain degree of response. Thirdly, it may be that preferential looking is easier to do at first than recognition acuity testing. Simply having to look at the cards may have been easier for the participants than having to concentrate to name letters, numbers or symbols and may have resulted in most participants being able to respond somehow to the test, even if the visual acuity obtained was lower. These results differ from those obtained in a larger-scale study in which Teller cards provided better visual acuity than letters or Lea symbols.[30] Although it is difficult to reconcile the different results obtained between the 2 studies, one explanation may reside in the fact that the visual acuity in the study by Friedman et al[30] was measured by trained technicians while in the present study, it was measured by a professional optometrist. The optometrist constantly encouraged the participants to provide an answer, rather than simply accepting the fact that the participant stopped answering, as is done in the clinical setting. In addition, testing with the Teller cards required more time, and therefore more attention and concentration from the participants. The explanations had to be repeated very often, sometimes even before each card presentation. This may have led to more frustration and fatigue for the participants. In general, participants demonstrated a lack of interest in the test not too long after a few cards were presented. It was sometimes very hard to motivate them to continue testing and this may explain why the VA obtained with Teller cards gave poorer scores. Clinical experience with patients having severe cognitive deficits indicates that testing has to be adapted in order to perform a visual examination, including visual acuity measurements.[22] It might be that when

participants with cognitive deficits are constantly encouraged to respond, again, letters and numbers learned early in life constitute better stimuli to trigger an answer than vertical stripes. The order of presentation of the various charts did not influence the acuity measured in the present study, since randomization was used, and statistical analyses further confirmed these results.

One weakness of the present study is that VA could not be measured in a single test session for many participants with more severe cognitive problems. It was simply too demanding and too tiring for participants to sustain testing for longer periods of time, more so since no time limit was imposed to read any given chart. In addition, participants were allowed time to rest in between charts. Therefore, when the participant came for a second or third session, testing had to be continued with the other charts according to the pre-established randomization. The general and cognitive status of a participant on the day of testing may have influenced the level of VA obtained with a given chart. This seemed to be the case for at least one participant who did poorly on the Snellen chart in one session, but succeeded very easily at reading the ETDRS letters on a different day. However, the fact that randomization was used and looking at the overall VA scores obtained, the results indicate clear trends in the ability of participants to respond to the various charts presented.

In conclusion, our results demonstrate that visual acuity can be measured, and should at least be attempted, in nursing home residents with severe cognitive deficits. Our results further demonstrate that standard acuity charts using letters as

optotypes do provide good responses and visual acuity results. Testing requires, however, more time and encouragement in individuals with more severe cognitive deficits in order to obtain and maintain their collaboration. Additionally, further evaluation on a different day should be performed in individuals not able to respond to VA testing on the day of the eye examination.

Acknowledgements:

The authors thank all participants and their family for accepting participation in this study, the physicians and nurses for their help in the recruitment of participants, as well as the Fondation Caroline-Durand and the Canadian Optometric Education Trust Fund for financial support.

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Table I. Summary of visual acuity measurements.

	VA Chart	Visual acuity Log ± SD	Visual acuity (20/20)	Number of charts successfully completed	Reading Time Min ± SD
Group 1	Snellen	-0.13 ± 0.05	20/15	30	---*
n= 30	Teller	-0.20 ± 0.07	20/13	30	---
Young subjects	Numbers	-0.06 ± 0.06	20/17	30	---
24.9 ± 3.5 yrs	ETDRS letters	-0.12 ± 0.08	20/15	30	---
	Tumbling E	-0.10 ± 0.07	20/16	30	---
	Patty Pics	-0.06 ± 0.08	20/17	30	---
Group 2	Snellen	-0.08 ± 0.06	20/17	30	---
n= 30	Teller	0.06 ± 0.22	20/23	30	---
Older subjects	Numbers	-0.01 ± 0.07	20/19	30	---
70.0 ± 4.5 yrs	ETDRS letters	-0.07 ± 0.06	20/17	30	---
	Tumbling E	-0.04 ± 0.05	20/18	30	---
	Patty Pics	0.01 ± 0.06	20/20	30	---
Group 3	Snellen	0.24 ± 0.23	20/35	24	4.0 ± 2.6
n= 30	Teller	0.51 ± 0.20	20/65	29	7.4 ± 3.0
Subjects with dementia (9.8 ± 7.5)	Numbers	0.29 ± 0.18	20/39	26	5.8 ± 4.8
85.6 ± 6.9 yrs	ETDRS letters	0.26 ± 0.21	20/36	27	4.6 ± 3.1
	Tumbling E	0.28 ± 0.17	20/38	21	6.5 ± 4.3
	Patty Pics	0.49 ± 0.22	20/62	23	6.2 ± 3.3
Group 3	Snellen	0.19 ± 0.12	20/31	10	2.8 ± 1.9
n= 11	Teller	0.41 ± 0.13	20/51	11	5.9 ± 2.5
MMSE ≥ 13 (17.8 ± 3.7)	Numbers	0.28 ± 0.15	20/38	11	4.9 ± 5.2
84.6 ± 6.8 yrs	ETDRS letters	0.22 ± 0.21	20/33	11	3.6 ± 2.0
	Tumbling E	0.22 ± 0.13	20/33	10	5.2 ± 2.5
	Patty Pics	0.46 ± 0.27	20/58	11	5.2 ± 2.1
Group 3	Snellen	0.28 ± 0.29	20/38	14	4.7 ± 2.8
n= 19	Teller	0.56 ± 0.21	20/73	18	8.4 ± 3.1
MMSE < 13 (5.2 ± 4.6)	Numbers	0.29 ± 0.20	20/39	15	6.5 ± 4.6
86.1 ± 7.2 yrs	ETDRS letters	0.29 ± 0.22	20/39	16	5.3 ± 3.6
	Tumbling E	0.34 ± 0.19	20/44	11	7.7 ± 5.3
	Patty Pics	0.52 ± 0.17	20/66	12	7.2 ± 3.9

*Data not collected

CONCLUSION

En conclusion, cette étude nous aura permis de répondre à nos objectifs de base. Nous avons été capables de mesurer l'acuité visuelle à l'aide de différentes échelles, chez une population institutionnalisée, atteinte de déficits modérés à sévères de la cognition et de la communication. Nous savons que l'optimisation de l'afférence visuelle est particulièrement importante chez une population âgée institutionnalisée, chez qui la démence et le déficit visuel sont très prévalents. Cependant, toutes les études effectuées à ce jour ont testé des personnes âgées ayant un déficit cognitif léger à modéré, et les résidents ayant un déficit cognitif plus sévère étaient le plus souvent exclus.

Nos résultats ont ainsi démontré qu'il était possible de mesurer l'acuité visuelle chez des résidents en institution présentant des déficits sévères de la cognition. Ils indiquent surtout que la mesure d'acuité visuelle doit toujours être tentée, quelque soit le niveau cognitif du patient.

Nos résultats démontrent également que les échelles d'acuité visuelle les plus universelles, qui utilisent des lettres comme optotypes, permettent tout d'abord de mesurer l'acuité visuelle, même chez les sujets ayant un déficit cognitif plus sévère, mais aussi d'obtenir de bons résultats d'acuité visuelle. Cette conclusion prend toute son importance dans un cadre clinique, où l'échelle la plus traditionnellement utilisée est l'échelle de Snellen, présentant des lettres comme optotypes.

Cependant, il est vrai que tester des personnes âgées ayant des déficits cognitifs plus sévères requiert plus de temps et d'encouragement, afin d'obtenir et de maintenir leur collaboration pendant l'examen, et plus particulièrement lors de la mesure de l'acuité visuelle. Notre expérience clinique auprès des personnes âgées ayant des déficits cognitifs sévères nous a appris que l'examen visuel doit être adapté afin de répondre aux besoins de cette population.

Bien que notre étude ait démontré qu'il était possible de mesurer l'acuité visuelle chez les personnes âgées institutionnalisées ayant des déficits cognitifs plus sévères, les échelles existantes ne sont sans doute pas idéales pour cette population. Il faut se rappeler que nous avons testé uniquement l'œil ayant la meilleure acuité visuelle et que le temps pris pour effectuer cette mesure chez les personnes ayant un MMSE < 13 était de 6,6 minutes en moyenne. Il faudrait idéalement envisager l'élaboration d'une échelle d'acuité visuelle « universelle » spécifiquement adaptée aux personnes âgées ayant de la difficulté à communiquer ou à collaborer. Il s'agit certes d'un projet très ambitieux, mais qui pourrait fortement contribuer à améliorer le déroulement des examens visuels auprès de cette population, plus particulièrement dans les institutions de soins de longue durée.

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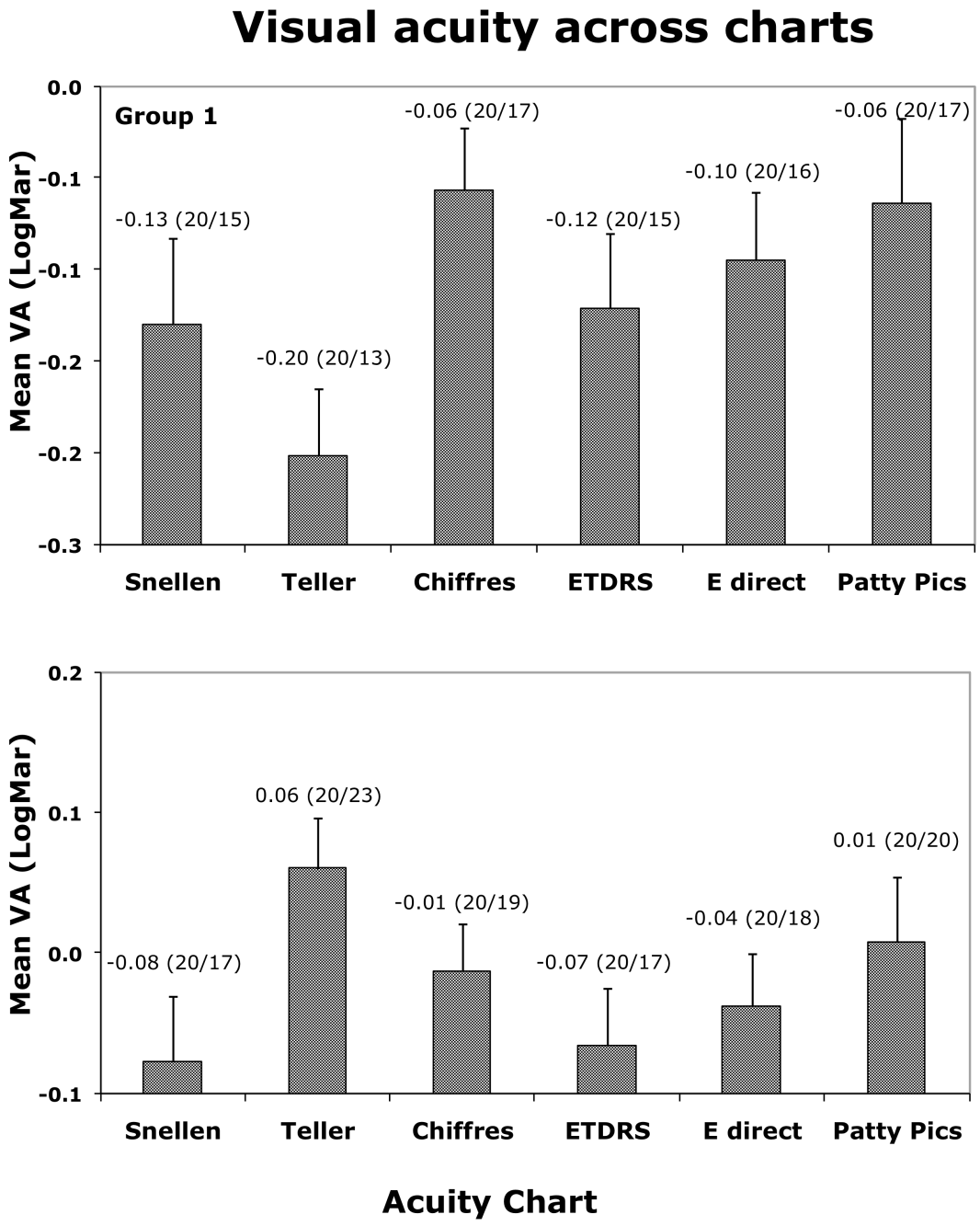
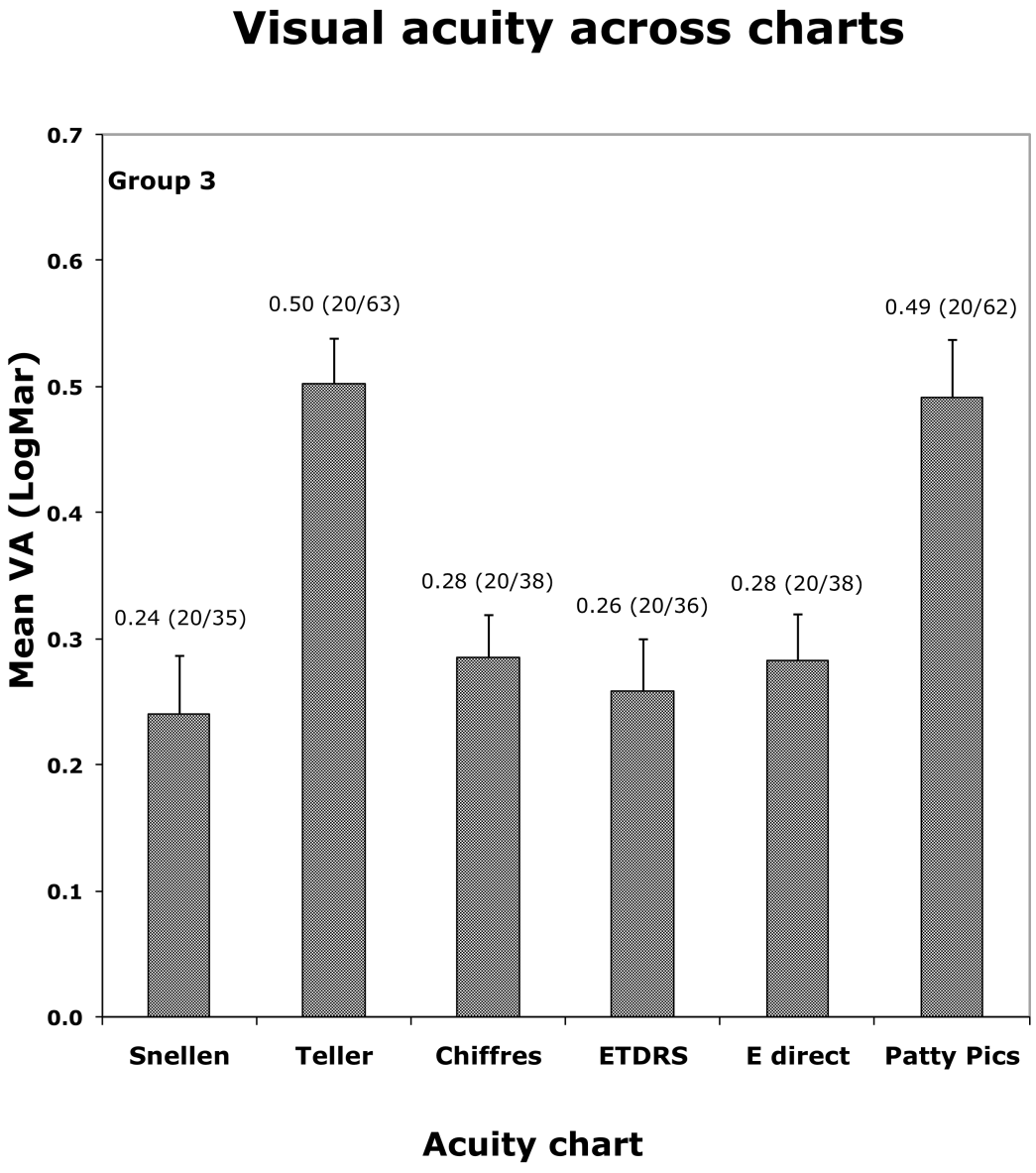
APPENDICES

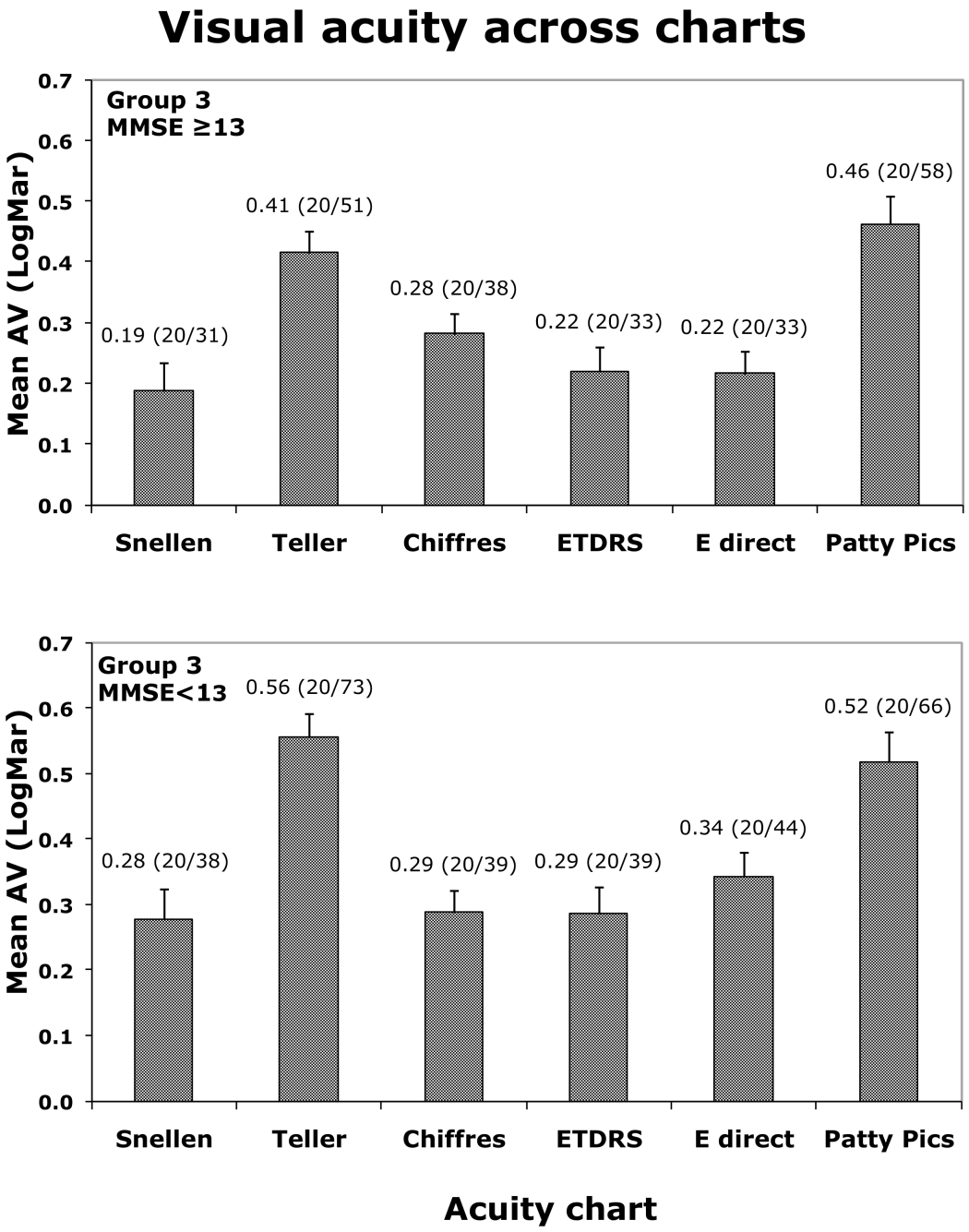
Appendice 1 : Moyennes et écart-types des mesures d'acuité visuelle pour les groupes 1 et 2.



Appendice 2 : Moyennes et écart-types des mesures d'acuité visuelle pour le groupe 3.

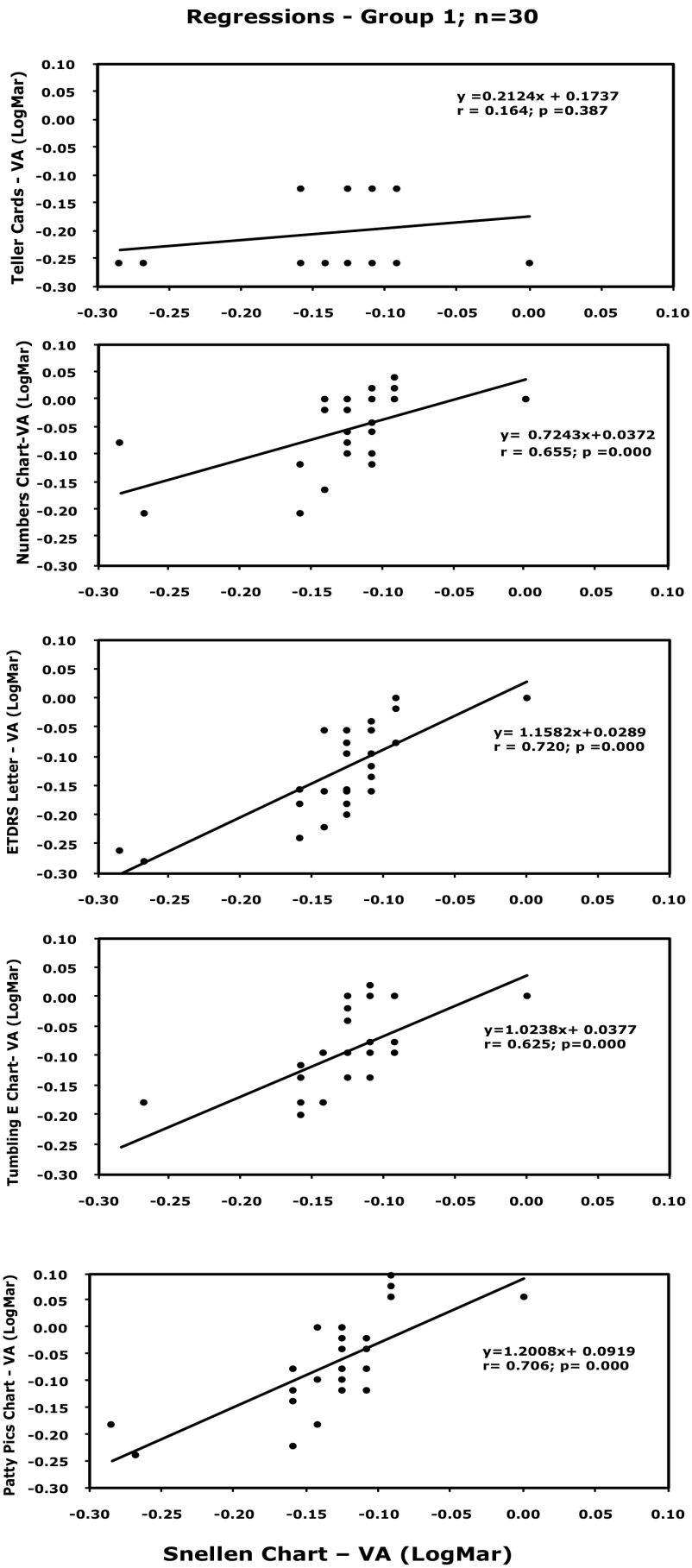


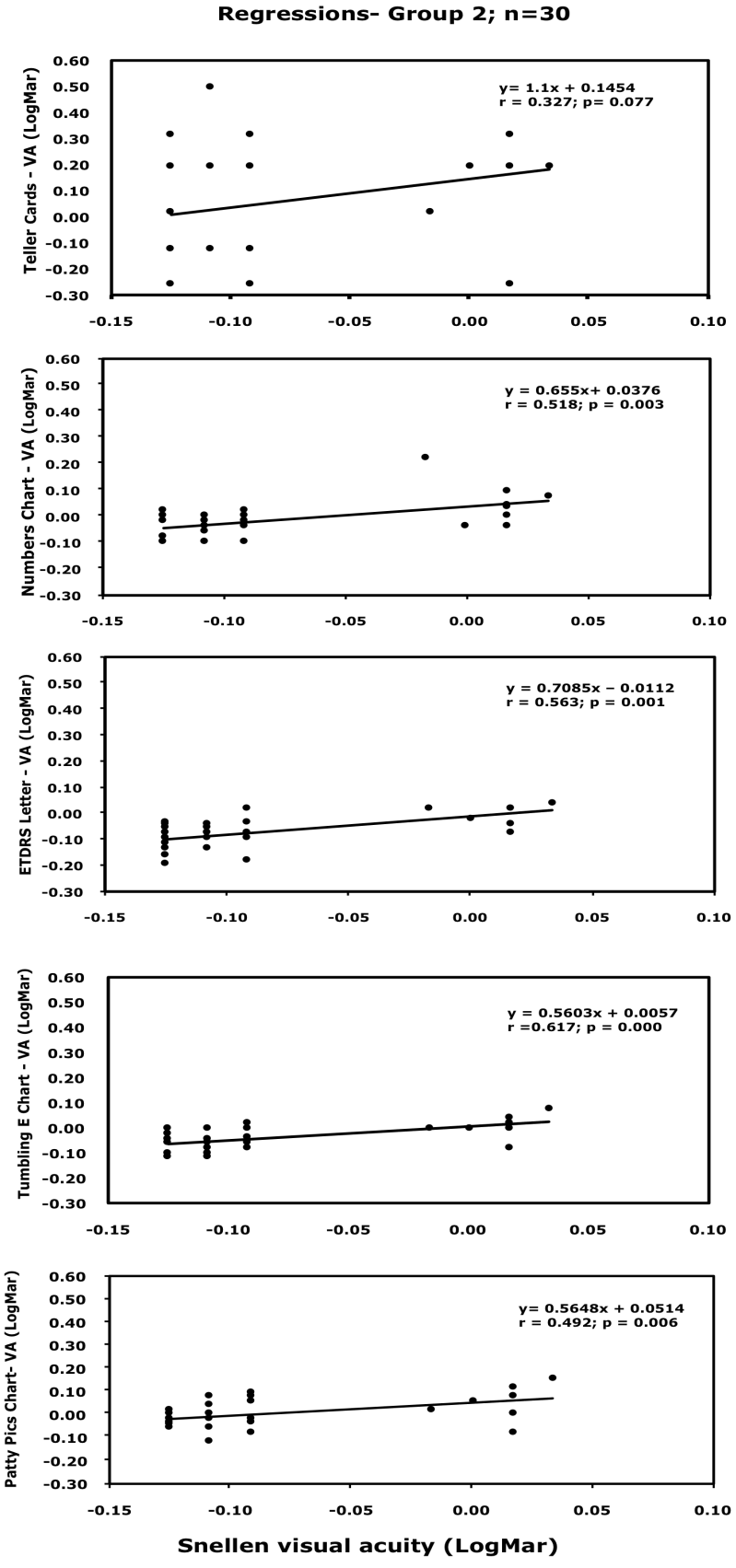
Appendice 3 : Moyennes et écart-types des mesures d'acuité visuelle pour les sous-groupes MMSE ≥ 13 et MMSE < 13.

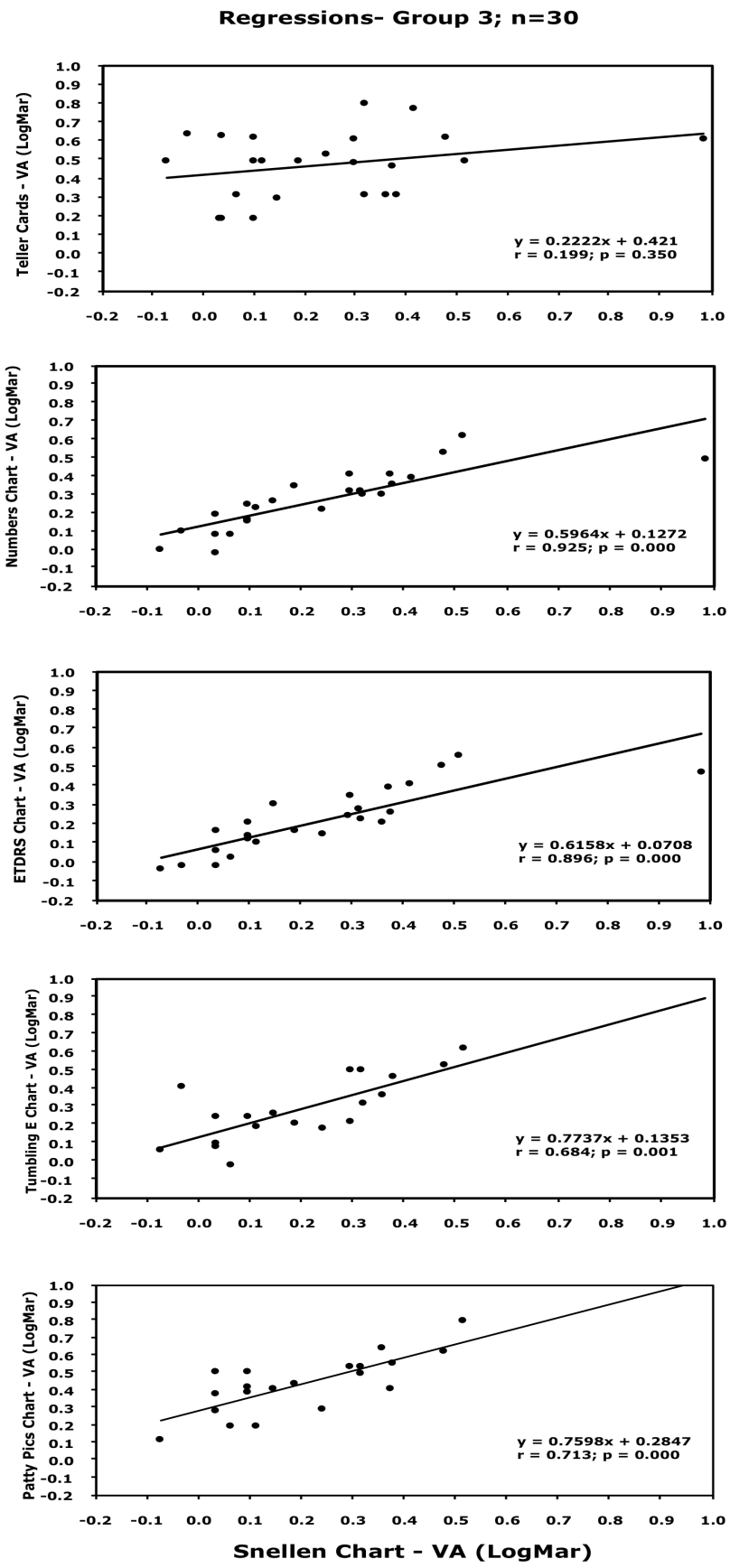


Appendice 4 :

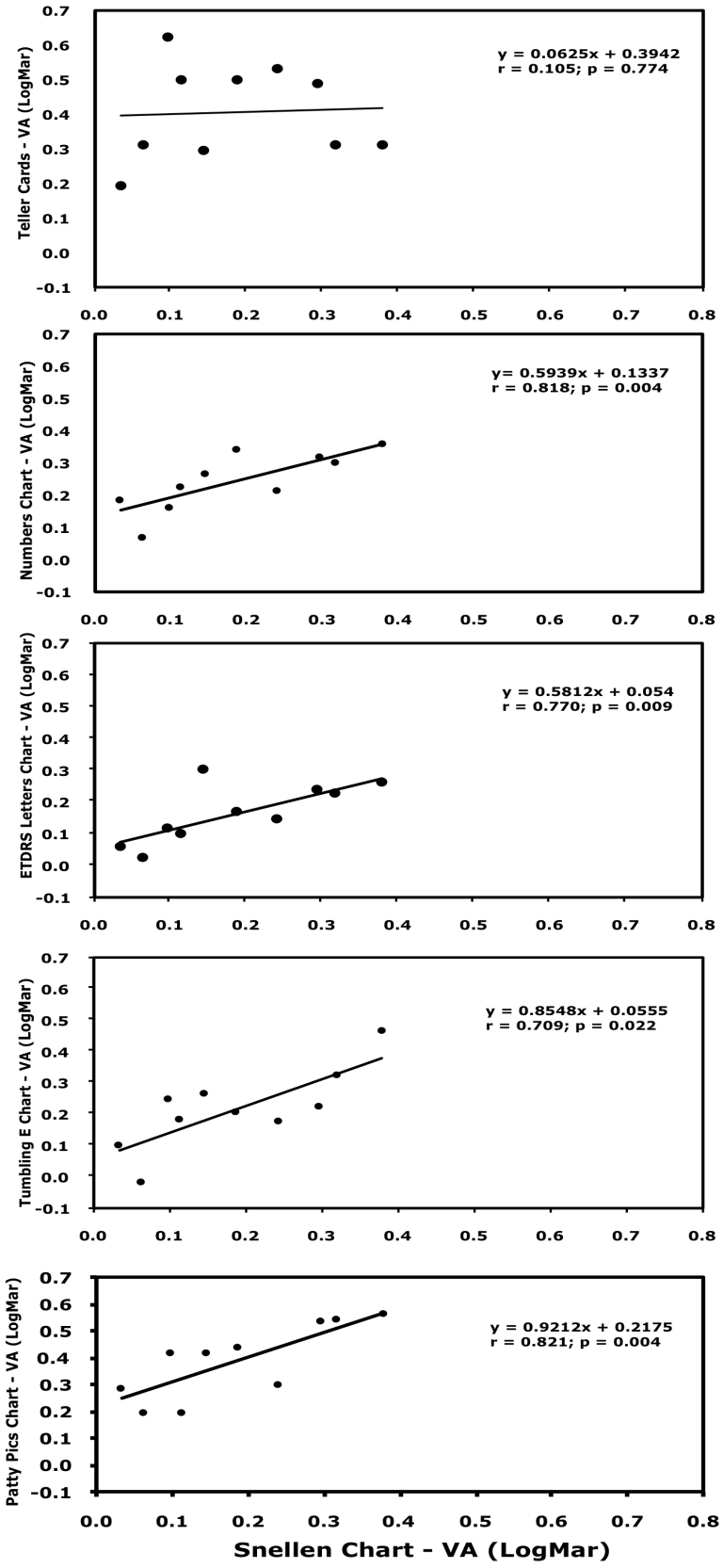
Graphiques montrant la droite de régression entre les valeurs d'acuité visuelle obtenues avec chaque échelle *versus* les valeurs d'acuité visuelle obtenues avec l'échelle de Snellen. Ces graphiques ont été effectués pour chacun des groupes à l'étude, soit les groupes 1, 2 et 3 ainsi que les deux sous-groupes, c'est-à-dire MMSE $\geq$ 13 et MMSE < 13. La pente de la droite de régression, la valeur du coefficient de corrélation de Spearman (rho) « r » ainsi que la valeur de significativité « p » sont indiquées sur chaque graphique.

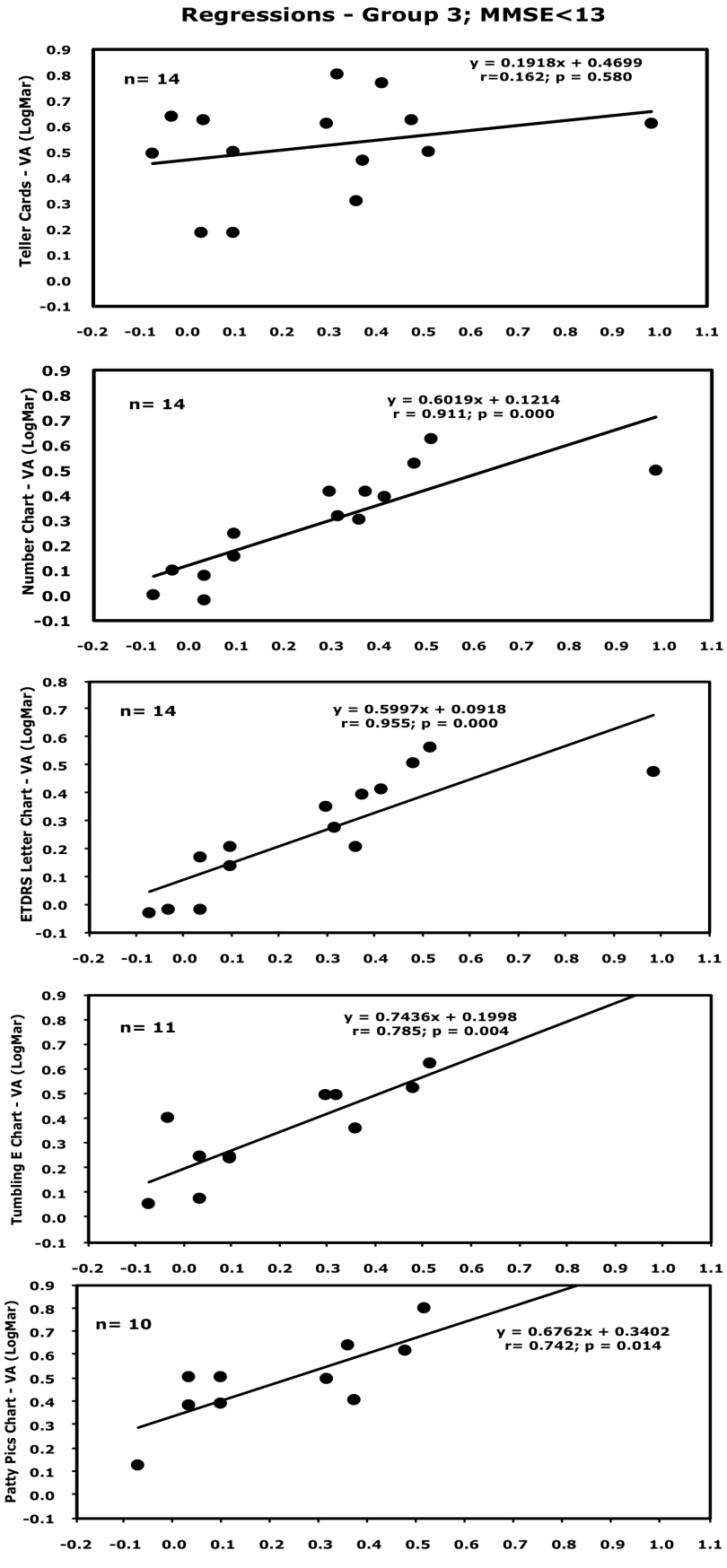

Regressions - Group 1; n=30
Teller Cards - VA (LogMar)
y =0.2124x + 0.1737
r = 0.164; p =0.387
Numbers Chart-VA (LogMar)
y= 0.7243x+0.0372
r = 0.655; p =0.000
ETDRS Letter - VA (LogMar)
y= 1.1582x+0.0289
r = 0.720; p =0.000
Tumbling E Chart- VA (LogMar)
y=1.0238x+ 0.0377
r= 0.625; p=0.000
Patty Pics Chart - VA (LogMar)
y=1.2008x+ 0.0919
r= 0.706; p= 0.000
0.10 0.05 0.00 -0.05 -0.10 -0.15 -0.20 -0.25 -0.30
-0.30 -0.25 -0.20 -0.15 -0.10 -0.05 0.00 0.05 0.10
Snellen Chart – VA (LogMar)


Regressions- Group 2; n=30
Teller Cards - VA (LogMar)
y= 1.1x + 0.1454
r = 0.327; p= 0.077
Numbers Chart - VA (LogMar)
y = 0.655x+ 0.0376
r = 0.518; p = 0.003
ETDRS Letter - VA (LogMar)
y = 0.7085x – 0.0112
r = 0.563; p = 0.001
Tumbling E Chart - VA (LogMar)
y = 0.5603x + 0.0057
r =0.617; p = 0.000
Patty Pics Chart- VA (LogMar)
y= 0.5648x + 0.0514
r = 0.492; p = 0.006
Snellen visual acuity (LogMar)


Regressions- Group 3; n=30
Teller Cards - VA (LogMar)
y = 0.2222x + 0.421
r = 0.199; p = 0.350
Numbers Chart - VA (LogMar)
y = 0.5964x + 0.1272
r = 0.925; p = 0.000
ETDRS Chart - VA (LogMar)
y = 0.6158x + 0.0708
r = 0.896; p = 0.000
Tumbling E Chart - VA (LogMar)
y = 0.7737x + 0.1353
r = 0.684; p = 0.001
Patty Pics Chart - VA (LogMar)
y = 0.7598x + 0.2847
r = 0.713; p = 0.000
Snellen Chart - VA (LogMar)

Regressions - Group 3: MMSE≥13; n=10




Regressions - Group 3; MMSE<13
Teller Cards - VA (LogMar)
n= 14
y = 0.1918x + 0.4699
r=0.162; p = 0.580
Number Chart - VA (LogMar)
n= 14
y = 0.6019x + 0.1214
r = 0.911; p = 0.000
ETDRS Letter Chart - VA (LogMar)
n= 14
y = 0.5997x + 0.0918
r= 0.955; p = 0.000
Tumbling E Chart - VA (LogMar)
n= 11
y = 0.7436x + 0.1998
r= 0.785; p = 0.004
Patty Pics Chart - VA (LogMar)
n= 10
y = 0.6762x + 0.3402
r= 0.742; p = 0.014
Snellen Chart - VA (LogMar)