

The Abbreviated Mental Test Score; Is There a Need for a Contemporaneous Update?

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Abstract

Introduction: Designed in 1972 the Abbreviated Mental Test Score (AMTS) is widely used to assess a cognition on hospital admission. The Nottingham Hip Fracture Score uses this in predicting morbidity/mortality in neck of femur fracture. The consequences of misappropriating cognitive impairment could have lasting implications. Questions about the monarchy or World War One and Two may be inappropriate for today's diverse society. **Materials and Methods:** 100 patients were questioned during routine fracture clinic appointments. Patients were asked: In what year did WWII start? Who is the current monarch? Please state a memorable event in your lifetime that you would not expect another person of the same age to forget. Two-tailed Z-tests were performed between the observed proportions and those from the original AMTS validation study. **Results:** Only 47% (n = 47) were able to correctly answer the year in which WW2 started. A statistically significant difference when compared to the upper and lower limits from the original study (z = -4.191, p < .001.). Significance was not seen in the second question, with 97% (n=97) identifying the monarch correctly. 51% (n = 51) of participants suggested the terrorist attack on the World Trade Centre in New York as an alternative memorable event. **Discussion:** Some hospitals now use the 4 "A"s Test (4-AT) as a screening tool for delirium. Without amendments to the Nottingham Hip Fracture Score, AMTS use is likely to continue in orthogeriatric patients. Over time there will be a need for the AMTS to be reviewed so that it remains a true assessment of cognition. Its limitations regarding language and culture is widely acknowledged and several validated variants have been published in the literature. **Conclusions:** We highlight a potential future issue with the AMTS and raise considerations for the development of an alternative question to better meet the needs of the orthogeriatric population.

Keywords

geriatric trauma, geriatric medicine, delirium, dementia, trauma surgery

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Introduction

In the presence of an ever-growing elderly population, the need for a simple and effective screening tool to assess whether a patient has cognitive impairment is of utmost importance. Established in 1972 the Abbreviated Mental Test Score (AMTS) is widely recognized and uses 10 questions (Table 1) to quickly assess a patient's cognition on admission to hospital.¹ Each correct answer scores one point, and with a total of 10 points available a score of fewer than 8 points is suggestive of cognitive impairment.

The AMTS is included as part of the Nottingham Hip Fracture Score; an assessment and prognostic indicator for 30-day and 1-year mortality following operative management of neck of femur fracture.^{2,3} In many hospital trusts, this scoring system

is used to help informed patient consent and explanation of operative risk to both patients and their family members.

Each question of the AMTS was designed to assess a different part of cognitive function. Question 8 in Hodgkinson's original

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Table 1. The Abbreviated Mental Test Score¹

Question
1. How old are you?
2. What is the time? (To the nearest hour)
3. Address Recall, at the end of the test, eg: 42 West Street
4. What year is it?
5. What is the name of this place?
6. Can you recognize 2 relevant persons?
7. What is your date of birth?
8. Start of World War 1?
9. Who is the current monarch?
10. Count back from 20 to 1.

AMTS assessed long term memory by asking the individual to name the year/ date of the start of World War 1 (WWI). However, the AMTS is often modified in practice by now asking the dates of World War 2 (WWII), as it is more likely to be a significant event of living memory for many patients.

As time passes the recall of a date such as WWI or WWII could become a less reliable assessment of long-term memory, and instead may solely be testing the knowledge of taught history. In a diverse and multicultural society asking this information may not be appropriate to some individuals. The consequences of misappropriating cognitive impairment may have lasting implications on a patient's hospital journey.

The validation of the AMTS followed a large multicenter study of mental impairment in the elderly conducted by the Royal College of Physicians.⁴ In this study, 187/588 of patients scored higher than 25 points in the Mental Test Score and were therefore deemed "mentally normal." When proposing the AMTS, Hodkinson¹ reports that between 72-95% of those meeting these criteria were able to successfully recall the year/date of the start of WWI. In the same cohort 84-99% correctly named the monarch.

Our study, conducted before the COVID-19 global pandemic, aims to review whether Question 8 and Question 9 of the AMTS remain contemporaneous and explore the suitability of alternative significant memorable dates to further develop this cognitive assessment.

Materials and Methods

To achieve the aims, it was decided that the following 3 questions, the first 2 being components of the modified AMTS, would be asked of participants:

1. In what year did WWII start?
2. Who is the monarch?
3. Please state a memorable event in your lifetime that you would not expect another person of the same age to forget.

Patient recruitment occurred during routine orthopedic fracture clinic appointments at a single center. Adult patients were consecutively surveyed with verbal consent by 1 of 2 clinicians. Age <18, Age >75, or a known history of cognitive

impairment were exclusion criteria for involvement in the study. This process was continued until a study population of 100 participants was achieved.

Subsequent results were tabulated. Statistical testing was conducted in Microsoft Excel (Microsoft Corporation, Washington, US) using a 2-tailed Z-test between the observed proportion and the upper and lower reported proportions from the Hodkinson data.

Our hypothesis testing was defined as follows :

$$H_0 : \hat{p}_o = \hat{p}_h \quad H_a : \hat{p}_o \neq \hat{p}_h \quad \alpha : 0.05$$

Results

The study population of n = 100 participants was achieved, and all data was included in the analysis. The results (Table 2) show that the study population had some difficulty answering our first study question. Only 47% of participants (n = 47) were able to correctly answer the year in which WW2 started. This finds a statistically significant difference compared to the lower percentage limit from the Hodkinson study. $z = -4.191$, $p < .001$. When broken down by age, the disparity between the number of correct and incorrect answers increased albeit without statistical significance, with 64% (n = 14) of young adults aged ≤ 30 years unable to answer correctly.

Identification of the monarch through the second study question was answered correctly by 97% of participants (n = 97) and there was little disparity between the age groups. This was significantly different from the low range percentage from Hodkinson. $z = 3.294$, $p = .001$. However, when compared to the high range percentage there was no significant difference in the result. $z = -1.252$, $p = .21$.

With respects to the third study question: 51% (n = 51) of participants suggested the terrorist attack on the World Trade Centre in New York. Other answers included the London Olympics (2012), the England football world cup win (1966) and the terrorist attack on the London Underground (07/07/2005).

Discussion

Evidence does exist to suggest that the AMTS remains applicable to the majority of older patients at this moment in time at emergency admission to the general hospital.^{5,6} Our study, however, raises the important issue that as time passes there will be a need for this to be reviewed to ensure that it remains validated.

Our results suggest that there may be a need to update the current AMTS questions to meet changing population needs and that in the future the current Question 8 may become unsuitable in the assessment of long-term memory. Our study design excluded participants for whom WWII would be a living memory, through means of the upper age limit of 75. We were unable to ascertain if there was a significant difference between different age groups in our study population due to insufficient statistical power.

The limitations of the AMTS regarding language and culture has been widely acknowledged and several validated variants have been published in the literature.^{3,7-10} In place of the

Table 2. Summary of Results.

Question	Study Population (n = 100)		Hodkinson (n = 187) ^{1,4}			
	Correct	Incorrect	Lower % Correct		Upper % Correct	
In what year did WWII start?	47% (n = 47)	53% (n = 53)	72%	p < .001	95%	p < .001
Who is the monarch?	97% (n = 97)	3% (n = 3)	84%	p = .001	99%	p = .21

British Monarch, the Polish variant uses the identification Lech Wałęsa the first democratically elected president following the fall of the Eastern Bloc.⁷ A comparable change is made in an Italian study for the Italian President.⁸ Alongside respective leaders, the dates of WWI are substituted in the validated Hong Kong study with the date of the mid-Autumn festival and the Iranian version with the Iraqi-Iranian war.^{9,10}

The potential issues with Question 8 have also been highlighted by additional alterations in the United Kingdom. Care Inspector (the Scottish independent regulatory body for social care) have removed this question from their AMTS and have replaced it with “Name the current Prime Minister,” however this question does not appear to assess long-term memory and therefore may affect the validity of the overall score result.¹¹ County Durham and Darlington NHS Trust dementia screening tool advises clinicians to tailor the question to a world event that an individual patient should remember from their childhood.¹² Some trusts now use the 4 “A”s Test (4-AT) as a screening tool for delirium on hospital admission.¹³ However, without amendments to the Nottingham Hip Fracture Score, the use of the AMTS is likely to continue in orthogeriatric patients.

Despite addressing the study aim, a major limitation of our study lies with the fact patient demographic data was not recorded. As such we have been unable to correct for the documented impact of education, language, cultural identity in our results and this may affect validity.

Another limitation to our study stems in the comparison to historic percentages without access to the original data sets. As such it was only possible to compare to an upper and a lower percentage, whereas the actual historical proportion likely lay between the 2 values. Our conclusion with regard to Question 8 (WWII) is likely to be relevant. However, concerning Question 9 (Monarch), it is not possible to conclude with significance for this reason.

When the AMTS was developed in 1972, there had been 6 different monarchs since the turn of the century. At that time Queen Elizabeth II had been on the throne for only 20 years, however, she is now the longest-reigning Monarch. This may mean that over time Question 9 has become easier to answer than it would have been in the past. This raises a question that needs to be addressed with further research.

Our study population widely suggested the terrorist attack on the World Trade Centre in New York as an alternative. Using this event may however confuse, and the date is presented most widely in the media using the American date format: “9/11.” There is concern over whether this alone would

suffice, or if the year (2001) would be more appropriate. Our study is limited in assessing this further as it did not ask individuals for the correct date, whether that be the year, day, or the month.

Our study was performed before the COVID-19 global pandemic. However, given the gravity of the worldwide disruption, the associated mortality, and indiscriminate nature to geographical or cultural borders, COVID-19 may be an equally viable alternative.

Conclusion

Despite a small sample size and limited statistical power, we highlight a potential future issue with the AMTS and raise considerations for the development of an alternative question to better meet the needs of the aging population. Future studies should seek to validate any new question before subsequent clinical implementation.

Author’s Note

K. A. Peters and T. J. Howe contributed equally as first authors.


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