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Mental illness and road safety

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Introduction. Psychiatric disorders, either due to their psychopathology or the drug treatments required, may lead to changes in perception, information processing and integration, and psychomotor activity which may disturb and/or interfere with the ability to drive safely.

Method. This study assesses competence to drive in a sample of psychiatric outpatients, with a driver's license, who drove regularly. This ability was assessed with the accredited LNDETER 100 battery, an electronic assessment unit measurement, in different clinical situations.

Results. Only 24 of the 120 patients passed the four tests required to obtain or renew a driver's license, and 80% failed in at least one of the required tests. None of the patients studied had notified the traffic authorities or the examination centers that they had a psychiatric condition that could affect safe driving. No patient stopped driving, although 10% of them admitted that their ability to drive was somewhat deteriorated.

Conclusions. Psychiatric patients with altered psychomotor performance should be a concern for psychiatrists and general practitioners regarding their competence to drive vehicles. Clinical, ethical and legal aspects of our findings are discussed.

Key words:

Fitness to drive. Psychiatric disorders. Drug treatment. Behavior toxicity.

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la actividad psicomotora que pueden alterar y/o interferir con la capacidad para una conducción segura.

Método. El presente estudio valora la competencia para la conducción de vehículos de una muestra de pacientes psiquiátricos ambulatorios, con licencia de conducir y que conducen asiduamente, que cumplieron la batería psicotécnica computarizada homologada LNDETER 100 en diferentes situaciones clínicas.

Resultados. De los 120 pacientes estudiados, únicamente 24 superaron las cuatro pruebas requeridas para la concesión o renovación del permiso de conducción, mientras que el 80% fracasó en al menos una de las pruebas exigidas. Ninguno de los participantes en el estudio declaró su enfermedad o su tratamiento a las autoridades de tráfico ni a los centros de reconocimiento existentes. Ningún paciente dejó de conducir, aunque un 10% de ellos consideró que su capacidad estaba en algún modo deteriorada.

Conclusiones. Los pacientes psiquiátricos con un funcionamiento psicomotor alterado deben ser una preocupación para los psiquiatras y médicos generales en la precisión de su competencia para la conducción de vehículos. Se discuten las consideraciones clínicas, éticas y legales de los hallazgos del estudio.

Palabras clave:

Competencia para la conducción. Enfermedad mental. Psicofármacos. Toxicidad conductual.

Enfermedad mental y seguridad vial

Introducción. Los trastornos psiquiátricos, bien por su psicopatología o por los tratamientos farmacológicos que precisan, pueden producir cambios en la percepción, en el procesamiento e integración de la información y en

INTRODUCTION

Driving is a complex skill that requires adequate information processing, vigilance or attention maintenance, concentration and good memory. The person must control his/her impulses, their assuming of risks should be sensible and prudent, and the person should be capable of anticipating the actions of other users on the road¹. Therefore, it can be considered that many psychiatric disorders, either because of their psychopathology or the psychodrug treatments required, may involve road safety risks². However, up to now, there is little evidence that confirms that psychiatric patients are dangerous drivers.

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Traffic accidents have become one of the most serious public health problems in Western societies³. The causes of traffic accidents are multifactor and it is very difficult to establish the degree to which a psychiatric disorder or its treatment is responsible for them, among other factors because there is no obligation to collect data or report to the traffic authorities when a medical or psychiatric disease may be considered to be a contributing factor in an accident, although this is sometimes done.

In Spain, the General Regulation of Drivers (RD 772/97)⁴ transposes Community Directive 91/439/EC, in turn modified by the Directives 94/72/CE and 96/47/CE⁵, that regulates the psychophysical aptitudes required to obtain or revoke the driver's license or permission in its annex IV. The aptitude criteria differ according to whether the driver wants to obtain a driver's license for non-professional drivers or for the group of professional drivers. The criteria are more restrictive for the latter group because of greater exposure to risk, greater repercussion in case of accident (dangerous merchandise, collective transportation), etc. The basic unit of this model is the medical and psychotechnical examination centers, whose objective is to evaluate psychophysical aptitude conditions in order to determine the ability of the driver. Based on this evaluation, if necessary, restrictions, adaptations or limitations that allow for safer driving conditions must be established⁶.

Evaluation of the psychophysical aptitude conditions to determine the ability of the driver is performed using one of the three existing homologated computer-based psychological batteries: DRIVER-TEST, LNDETER-100 and Coordinator-2000. A double evaluation must be made in the psychotechnical examination: on the one hand, quantitative, through standardized tests, and on the other, qualitative, in which attitude and behavior of the applicant during the tests are evaluated.

The law should prevent any person who does not meet the medical aptitude criteria from having a driver's license. However, the law on aptitude for driving vehicles is still vague in most European countries. It is the legal responsibility of the license holder to stop driving and to notify the authorities if he or she has any type of medical or psychiatric condition that may affect safe driving. Not doing so and giving false information is an offense. There are also implications with the insurance.

The present study aims to evaluate the effect that mental disease and the psychopharmacological treatments used in the clinical practice have on cognitive functioning and psychomotor aptitudes that condition safe driving through the study of a sample of out-patient psychiatric subjects.

METHOD

Cognitive functioning and psychomotor aptitudes were evaluated in different clinical situations in 120 out-patient psychiatric subjects seen consecutively in a Community Mental Health Care Unit of the Canary Islands who had a driver's license and drove regularly.

Table 1 shows the distribution of the sample of patients based on their age, gender, diagnosis, clinical global impression and drug treatment prescribed. The diagnoses of the patients were made in accordance with the criteria in chapter V of the ICD-10⁷ and grouped according to the principal categories of said classification, that included: F1: mental and behavioral disorders due to psychotropic substance use; F2: schizophrenia, schizotypal and other delusional disorders; F3: mood (affective) disorders; F4: neurotic, stress-related and somatoform disorders, and F6: disorders of adult personality and behavior. The severity of the clinical picture of the patient was evaluated with the Severity Index of the Clinical Global Impressions⁸ a scale that considers the grades of: normal, not ill; doubtfully ill; mildly ill, moderately ill; markedly ill; severely ill; and extremely ill. In order to aid the evaluation, the drugs consumed were placed into categories of groups of the usual psychodrugs: antidepressants (differentiating tricyclics, selective serotonin reuptake inhibitors [SSRI] and selective serotonin-norepinephrine reuptake inhibitor [SSNRI]), benzodiazepines; antipsychotics (differentiating the conventional ones from the atypical ones); anti-seizures and anti-Parkinsonians.

Cognitive functioning and psychomotor aptitudes were evaluated with the psychotechnical battery LNDETER 100⁹, homologized by the Normalization Committee for tests of the Directorate-General for Road Traffic, in accordance with Directive 91/439/EC of the European Union. This computer-based battery of tests evaluates psychophysical aptitudes that drivers should have based on the regulations in force.

The psychotechnical battery LND-100 is made up of the following elements.

Stimuli presentation unit

Formed by high resolution video screen (for the presentation of visual stimuli) and a speaker (for auditory stimuli).

Central unit of responses

Formed by three push buttons, two pedals and two levers. It contains the electronic measurement elements and microprogramming of the different tests in ROM.

Equipment control knob

It permits the psychologist to control the appearance of stimuli and development of the different test phases.

All the tests included in the battery are explained verbally to the person being examined prior to a trial phase that precedes the test performance.

The psychotechnical tests include in the LNDETER 100 battery are the following.

Table 1 Sociodemographic and clinical characteristics of the samples studied

Variable	Category	Number of cases	Percentage of the sample	
Age	< 25 years	7	5.8	
	Mean age: 42.5 ± 11.4 years	25-45 years	65	54.2
	Range: 19-66 years	45-65 years	47	39.2
		>65 years	1	0.8
Gender	Man	58	48.3	
	Woman	62	51.7	
ICD-10 diagnosis*	F1	14	11.7	
	F2	15	12.5	
	F3	54	45	
	F4	35	29.2	
	F6	2	1.7	
Clinical global impression-severity	Normal or borderline	63	52.5	
	Mildly ill	43	35.8	
	Moderately ill	13	10.8	
	Very ill	1	0.8	
Psychodrugs	None. Onsly psychotherapy	23	19.2	
	Mean 1.5 ± 1.1 drugs	One drug	40	33.3
	Range: 0-5	Two drugs	44	36.7
		Multimedication: 52.3%	Three drugs	4
		Four or more drugs		
Treatment	Antidepressants			
	Tricyclics	5	4.2	
	SSRI	25	20.8	
	SSNRI	36	30	
	Benzodiazepines	58	48.3	
	Antipsychotics			
	Conventional	9	7.5	
	Atypical	15	12.5	
	Anti-seizure drugs	11	9.2	
	Anticholinergics	4	3.3	
Driver's license	A	2	1.7	
	B	107	89.2	
	C	5	4.2	
	D	3	2.5	
	E	3	2.5	

*ICD-10 Diagnosis: (F1) mental disorders and behaviors due to psychotropic substance usage; (F2) schizophrenia, schizotypal disorders and other delusional disorders; (F3) mood disorders (affective); (F4) neurotic disorders, secondary to stress situations and somatomorphics, and (F6) personality and behavior disorders of the adult.

Concentrated attention and resistance to monotony test

It evaluates motor capacity of a subject in regards to the emission of a series of visual stimuli (colors and figures) and sounds represented in a monotone series.

Multiple discriminative reactions test

It evaluates the possible alterations in discrimination ability or response time. The subject should make a motor response to a series of visual stimuli (colors and figures) and sound.

Anticipation of speed test

It evaluates impulsivity through the motor response, stimulation of spatial-temporal reactions.

Bimanual coordination test

It evaluates the ability of a subject to coordinate and dissociate movements of each hand with an imposed rhythm not modifiable by the subject. The subject is required to give a bimanual type visuomotor response to two moving stimuli that simulate displacement over two tracks at an imposed rhythm, with a fixed and constant rate during the test. As it is a bimanual response, two tracks are presented that are asymmetric with their tracing, each one with a moving point to be controlled and lead by the subject.

Decision making test

It evaluates tendency to transgress rules (risk). Whether the subject accepts or assumes risk is controlled by the option foreseen in the test that allows to subject to not answer those items he/she is afraid to answer. The risk-benefit confrontation situation is controlled by the instructions and the objectives of the task itself that the subject must perform. The items or situations making up the test have been carefully designed according to an order of gradual difficulty, so that when the subject accepts to respond, this implies a certain level of risk.

In accordance with the regulation in force, the subject must pass the first four tests in order to be received or renew the driver's license. Passing the fifth test described is a requirement to obtain a gun license, to be used both for sport's activities and to work in a private security position. The latter has been included in the study because it is considered that its results can supply relevant information that complements the results of the tests required. However, the results of this test will not be taken into consideration when aptitude and driving competence are analyzed.

Data analysis

The continuous variables are presented as mean, standard deviation and range. Categorical variables, based on sample size and corresponding percentages. The following were done: an univariate analysis using the Student's *t* test for continuous variables (or the Mann-Whitney U test, as appropriate) and chi-square statistics for the categorical variables (of Fisher's exact test, in appropriate). We have also made multivariate analysis using a regression model to predict the aptitude and competence to drive based on the independent continuous and/or categorical variables considered that include: gender, age (as continuous variable), psychodrugs used (selective serotonin reuptake inhibitors,

serotonin-norepinephrine reuptake inhibitors, tricyclic antidepressant, benzodiazepines, conventional antipsychotics, atypical antipsychotics, anti-seizures, and anticholinergic), the diagnosis (considering the principal category of ICD-10) and disease severity (according to GCI-Severity).

RESULTS

The direct score of a person on a test cannot be interpreted directly if we do not refer to the contents included in the test or to the performance of the remaining persons who share the normative group. In one way or another, the scales consist in assigning a numeric value to each possible direct score (on a certain scale) that informs on the position occupied by the direct score (and thus by the person who obtains it) in relationship with those obtained by the persons forming the normative group where the tests are scored on a scale.

The stanines are normalized-type typical scores that form a scale of nine units, with mean of 5 and standard deviation of 2. When a person obtains stanine 8 on an aptitude test, this indicates that the person is 1.5 standard deviations above the mean of the normative group. Normally, a person is said to obtain a score close to the mean if his or her stanine is 4, 5 or 6. Stanines of 7 or 8 are generally interpreted as an indication of performance «above the mean», while a stanine of 9 is considered as exceptional performance. Stanines of 1 or 2 are interpreted as performances «considerably inferior to the mean and that are very poor».

Table 2 shows the results obtained by the patients of the sample in the different tests used to evaluate the ability to drive motor vehicles based on the present normative. In accordance with the Spanish legislation and European Directive, obtaining scores in stanines 1 or 2 in any of the tests required implies non-passing of the test and thus the non-granting or renewal of the motor vehicle driver's license.

Of the 120 patients studied, only 24 passed the four tests required to be granted or to renew the driver's license while 80% failed in at least on the tests required. None of the participants in the study declared their disease or their treatment to the traffic authorities or to the existing physical and psychotechnical examination center. No patient stopped driving although 10% of them considered that their capacity was in some way deteriorated.

Most of the patients of the sample did not pass the concentrated attention and resistance to monotony test since only 40% of them had scores that fulfilled the requirements of the regulation in force. Mean response time was the variable responsible for the most errors. The logistic regression analysis manifested that age and clinical severity of the patient significantly conditioned performance on the test. Thus, the greater the age or severity, the worse the performance.

Table 2		Results of the different tests conducted and driving competence. Results of the logistic regression analysis	
Tests	Porcentaje de patients in stanine 1 or 2	Variables in the equation	
Concentrate attention and resistance to monotony	60		
Mean response time	55.8	Age*, CGI-severity**	
Number of errors	22.5	Age**, CGI-severity*	
Multiple discriminative reactions	45.8		
Mean response time	40	Age**, CGI-severity**	
Number of errors	25	Age**, CGI-severity**	
Anticipation of speed	15		
Bimanua coordination	40		
Number of errors	14.2	Age**	
Time in error	25.8	Gender*, age**	
Decision marking	56.7		
Assuming risks	21.7		
Mean reaction time	44.2		
Global aptitude	80		

*Significance: $p < 0.01$. ** Significance: $p < 0.001$. Stanines 1 or 2 mean that the test results are very poor, considerably lower than the mean and in accordance with the current normative mean that the driver's license will not be granted or renewed.

Almost half the patients (46%) did not pass the multiple discriminative reactions test, demonstrating inadequate discrimination of visual stimuli (colors and figures) and of sound and incorrect allotment of the motor responses to the stimuli presented. Once again, mean response time was the variables responsible for the greatest number of errors. As in the previous test, age and clinical severity of the patient significantly conditioned performance on the test. Thus, the greater the age or severity, the worse the performance.

The anticipation of speed test was only failed by 15% of the patients, most of the sample subjects demonstrating adequate ability to judge distance and speed and adequate impulsivity. No variables of those studied were predictive of the results obtained.

A total of 40% of the patients did not pass the bimanual coordination test, thus manifesting an inadequate ability to coordinate and dissociate the movements of each hand with an imposed rhythm imposition that cannot be modi-

fied by the subject. Although the number of errors committed by the patients studied was not high, time inverted in the errors was responsible for most of the errors. In this test, the greater the age the greater the number of errors and time in error. Women had significantly worse results than men.

Finally, although the «decision making» test does not form a part of the current requirements of the regulation, most of the patients (56.7%) did not pass the test, mean reaction time being responsible for most of the errors. A total of 22% of the patients showed inadequate tendency to the transgression of rules.

Ten of the patients forming a part of the sample were professional drivers and they recorded similar results to those corresponding to the non-professional drivers, since only two of them passed all the tests required.

DISCUSSION

Driving motor vehicles is a right that all persons have since it provides them with autonomy and independence to get around. They also have the right to drive safely on public roads, so that a balance must be pursued to assure the safety of a driver with a psychiatric disorder and of the other users of the public roads.

The current regulation in force regarding ability to drive a vehicle of patients with mental disorders¹⁰ considers that there should be no mood state disorder that entails high probability of risk for one's own life or for that of others. It also states that, as a general rule, those persons who suffer mental disorders that suppose a risk for road safety, schizophrenia or other psychotic disorders, dissociative disorders, disorders of impulse control, personality disorders, attention deficit disorder or disruptive behavior will not be able to obtain or extend their driver's license. Rarely, and with a favorable report from a psychiatrist or psychologist, permission can be obtained or renewed for group 1 (non-professional) and in some diseases also for group 2 (professional). In every case, the validity period of the license will be reduced according to medical criteria. Regarding alcohol consumption, neither alcohol dependence nor abuses nor the existence of alcohol-induced disorders (abstinence, dementia, psychotic disorders, etc.) are permitted. Furthermore, if there is any background of having had any of the previous situations with a favorable report, the driver's license can be obtained or extended with a reduction in the expiry period according to medical criteria. In addition, the Penal Code typifies driving under the effects of alcohol as a offense.

Our study found that the performance of most of the out-patient psychiatric patients seen in a community mental health site who had a driver's license on their psycho-technical tests required were incompatible with the regula-

tion in force with having a driver's license; however, they continued to drive. The most concerning information is that 10 of the patients were professional drivers (and only two of them passed the tests).

In view of the results obtained in our study, the question arises on whether the procedure used to evaluate driving ability is valid and reliable even though it has been approved and is probably the one used most in the medical and psychotechnical examination sites for drivers. Currently, there is no single measure available that makes it possible to predict driving ability better. The neuropsychological tests, simulators, driving tests are used to evaluate cognitive function and driving ability. However, when they are used to predict driving ability, there is poor correlation between the driving tests made on the road or off them and the neuropsychological tests^{11,12}. The variability of the results between these studies is explained by the different experimental designs, variable of the object of interest, sample size, heterogeneity of the study groups, grade of premorbid functional deterioration and type of predictive tests (on or off the road, simulators, or neuropsychological tests).

As we see, there are methodological differences in the type of tests used for the evaluation of driving ability. The question arises: Is it essential to analyze the individual's driving ability in the natural setting, using road tests, such as driving tests at 100 kilometers, or can the driving ability be established exactly using inferences of psychomotor skills tests related with driving as the tests used in our study). And if the real driving ability is tested on the road, what are the critical variables to be studied? These questions are currently unanswered¹³.

Another piece of information that is of concern from our study is the fact that none of the patients seen in the community mental health unit declared their disease or treatment to the traffic authorities nor went to the existing medical and psychotechnical examination sites requesting information or evaluation of their aptitude. In addition, none of those who admitted that were felt that their driving ability was affected made any declaration in this regards or stopped driving. In accordance with the literature, only 6.6% of the drivers with pathological conditions consider that their driving aptitude is deteriorated and of these, only 3.1% stopped driving¹⁰.

It is not clear what professional should advise patients on the need to stop driving. Some doctors consider that it is not convenient to discuss driving ability with the patients since it could interfere with the therapeutic relationship and/or with adequate treatment compliance. However, many professionals are concerned about the possible legal consequences of giving incorrect or inadequate advice on driving¹⁴. Authors such as Niveau and Kelley-Puskas¹⁵ consider that the violation of confidentiality by the doctor on informing the authorities of those patients who are in a

risk situation is ethically questionable while the evaluation of the driving ability is not supported on objective bases.

Hollister¹⁶ considers that the psychiatrists feel little responsibility to determine the driving competence of their patients and that it is currently wise to be guilty of conservatism while the driving of a vehicle is considered by most of the people as a right that should only be revoked under the strictest circumstances. On the other hand, driving a motor vehicle may be fundamental for the functional autonomy of patients with psychiatric diseases and it is necessary to know more about the consequences of not driving for each patient specifically before making any decision. It is really necessary for them to drive? Is there anyone who can drive them?

The driver's license may mean independence for the patient, the ability to take care of him or herself and freedom to travel when they want. However, safety questions and evaluation of risks are the most important to be considered for the public in general.

A survey conducted among psychiatrists in Canada¹⁷ reached the conclusion that there is a clear need for education and guidelines to help the psychiatrists in decision making on the competence of the patients to drive vehicles. The answers of the psychiatrists demonstrated a wide range of attitudes, practices and knowledge, representative of the great distance existing between that expected from the psychiatrists and their disposition and perception of their clinical decision making ability related with driving safety.

Currently, and considering our study design, it cannot be discriminated whether the lack of competence in the patients to drive is due to the drugs, or to what type of drugs, or if it is due to the mental disease and to what type of disease. However, in the near future, we will have this information since the patients of the sample are still taking tests in different clinical situations that include: changes in their drug treatments (increase in the dose, decrease in the dose, suspension, etc.) and changes in their clinical condition (worsening, improvement, etc.):

At present, and with the information available, psychiatric patients who have altered psychomotor functioning should be of concern to psychiatrists and general physicians. The decision on who should forbid the driving and when is a difficult matter to judge, because little is still known, not only in general, about the real risks, but also specifically, on the individual limitations.

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