

## Personality differences of applicants for the gun license (proprioceptive and verbal tests)

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**Título:** Diferencias de personalidad en los solicitantes de licencia de armas (ensayos propioceptivos y verbales).

**Resumen:** El Diagnóstico Propioceptivo del Temperamento y del Carácter (DP-TC) (Tous, 2008), que se basa en el rendimiento de la motricidad fina sin visión del propio cuerpo, se utiliza junto con una prueba verbal de personalidad (Durán, García, García, & Martínez, 2001) para examinar las diferencias de personalidad entre los solicitantes del permiso de armas (GL) y la población en general (GP).

Los resultados del MANOVA mostraron diferencias significativas entre los dos grupos en la prueba DP-TC, el grupo GL obtiene una puntuación más alta en Emocionalidad (temperamento) e Impulsividad (temperamento y carácter) y una puntuación menor en Toma de Decisiones (temperamento y carácter) y Estado de Ánimo (temperamento); mostrándose más pesimistas que el grupo GP. En el grupo GL, el rendimiento del DP-TC se comparó con el resultado de la prueba verbal, por medio de un análisis de componentes principales con rotación varimax. Los resultados del temperamento del DP-TC mostraron sólo una asociación con las variables verbales, corroborando así la idea de que el temperamento está más libre de la influencia social. Al comparar los resultados de la prueba verbal con la propioceptiva observamos que la escala Emocionalidad del DP-TC era congruente con la escala verbal Fuerza del Ego, mientras que los resultados en Neuroticismo eran opuestos y podrían haber sido falsificados, con el fin de obtener la licencia de armas.

**Palabras clave:** componentes disposicionales de conducta; componentes intencionales de conducta; control motor; diagnóstico propioceptivo; solicitantes de la licencia de armas.

**Abstract:** The Proprioceptive Diagnosis of Temperament and Character (DP-TC) test (Tous, 2008), which assesses fine motor performance without vision of one's own body, was used together with a verbal personality test (Durán, García, García, & Martínez, 2001) to examine personality differences between a group of gun licence (GL) applicants and a group from the general population (GP).

MANOVA results showed significant differences between the groups on the DP-TC test, with the GL group scoring higher on Emotionality (Temperament) and Impulsivity (Temperament and Character) and lower on Decision-Making (Temperament and Character) and Mood (Temperament). In the GL group, fine motor performance on the DP-TC test was compared with the verbal test results by means of a principal components analysis with varimax rotation. The results corresponding to the Temperament dimensions of the DP-TC test showed only one association with the verbal test variables, thus corroborating the notion that Temperament has little social influence. Comparison of the proprioceptive and verbal tests showed that the results on the Emotionality scale of the DP-TC were consistent with those on the Ego-strength scale of the verbal personality test, but not with Neuroticism; this suggests that these subjects might fake their replies in order to obtain the gun licence.

**Key words:** dispositional components of behaviour; intentional components of behaviour; proprioceptive diagnostic; gun licence applicants.

### Introduction

In Spain there are around 3.5 million guns in private use. Epidemiological data show that the country has one of the highest rates of gun-related deaths in Western Europe, with men aged 40-54 years being the most frequently involved in homicides and suicides (Durán, García, García, & Martínez, 2001). Figures for the US show that around 31,600 people are killed with guns annually. The majority of these deaths (55%) are suicides, the remainder being homicides (37%), fatal gun accidents (5%), the result of legal interventions by police officers (1.5%) or cases in which intentionality is not established (1.5%). Guns are used in 59% of all suicides, and in 60% of all homicides (Kleck, 1991). In view of these figures, there is an urgent need to find ways of reducing gun ownership among the high-risk population.

To reduce the risk of the selection bias inherent in a verbal interview or test, non-verbal assessment is an important complementary procedure. We advocate the use of proprioceptive assessment in this situation, as we explain below.

Individual responsibility cannot be dissolved by the social environment: a crime cannot be justified merely by the social background of the person who commits it, since many

other people who experienced similar conditions do not engage in criminal activity. Individual behaviour is generally considered to be limited only by intentions, which are the final result of all our mental processes. However, individual behavioural responsibility should be considered from a dual perspective: from the intentional component (the mental content), and from the point of view of our body (the somatic basis that provides the dispositional component of behaviour).

The study of motor control (Rosenbaum, 2005) has shown that an intention can only be executed if it is accompanied by the necessary motor activity. As such, the motor component plays an important role in the selection of our intentions. Indeed, the execution of any human act is based on the interaction between intentions and dispositions, and it is a higher-order process that is closely linked to cognitive processes. For example, Ingram et al., (2000) demonstrated that cognitive performance (attention) depends on proprioception. These authors found that when attention was interfered with, control subjects showed a 10% drop in task performance, whereas in the absence of proprioception the corresponding reduction was 60%. A similar conclusion was reached by van Beers, Sittig and Denier van der Gon (1998), who showed that individuals without proprioception need to pay greater attention to the task than people who have it.

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More recently a study by our group (Fortuny, 2008) found a negative and statistically significant correlation ( $r(11) = -.34, p = .006$ ) between memory, as measured by the Rey-Osterrieth Complex Figure (Rey, 1941; Osterrieth, 1944), and proprioception, as measured by the Proprioceptive Diagnosis of Temperament and Character test (DP-TC). The conclusion was that the fewer proprioceptive biases someone has, the better his/her memory (both immediate and delayed) will be.

The individual behaviour of persons, driven by their intentions via the execution of muscular movements, is regulated by feedback obtained through two types of information: exteroceptive and proprioceptive. Exteroceptive information is information from the exterior which enters via the sensory system (vision, touch, hearing, taste and smell), whereas proprioceptive information comes from our body and indicates the muscular state that is necessary in order to maintain precise movements and to optimize our cognitive effort. Proprioception is considered to be the sixth sense (Dennis, 2006) that informs us, from within, about the position of our body and the changes it undergoes without using the other five senses.

Proprioceptive behaviour is individual and systematic for each person (Tous, Viadé & Muiños, 2006). Some people tend to perform movements in an outward direction, while others tend to do so inwardly. This depends on the proprioceptive information they have, and the resulting interpretation will be different for each movement type. For example, upward/downward movements in the frontal plane indicate the energy which counteracts the force of gravity, outward/inward movements in the transversal plane show the attention that is directed towards our own mental contents or environmental stimulus, and movements in the sagittal plan are related to tending towards oneself or away from oneself. The DP-TC comprises six orthogonal bipolar factors: 1) Mood, 2) Decision-Making; 3) Attention Style, 4) Emotionality, 5) Irritability, and 6) Impulsivity.

These factors are different from the ones that can be obtained on verbal tests since they correspond to how a person really behaves, rather than to what he/she thinks about his/her behaviour. As Kagan argues (2005), if our goal is to make reliable predictions about behaviour and to intervene effectively in it, it is more important to know how a person behaves than it is to know what that person thinks about him or herself. Corr (2010) also highlighted the importance of multi-layered personality assessment including pre-reflexive and automatic behaviour as well as reflexive behaviour.

Thus, the current study aims to investigate both basic (Temperament) and acquired (Character) facets of personality with the proprioceptive test (DP-TC), and the mental component with a verbal personality test (EAE<sup>1</sup>), in order to obtain a complete picture of the behavioural features of gun

licence applicants (GL) and the general population (GP) at both levels and to see whether the personality profile of gun licence applicants (GL) presented significant differences. We expected the comparison of the two tests to underline the importance of using multiple-layered behavioural assessments to obtain a more complete description of psychological profiles.

We also expected that the proprioceptive personality test would provide complementary information to the verbal test. Subjects performing graphomotor tasks without visual guidance and without seeing feedback are less able to fake their answers, and so the results are more objective. The information obtained in this way has obvious practical applications.

## Method

### Participants

The study included 278 healthy participants<sup>2</sup> with normal vision who were distributed into two groups: gun licence applicants at ten different accredited medical centres that certify fitness to possess firearms (ASECEMP, González, 2009) (GL group:  $n = 152$ , 84% men, age  $M = 46$ ,  $SD = 13$  years old, range 24-69) and volunteers from the general population from the Mira y López Laboratory selected as a control group (GP group:  $n = 126$ , 83% men, age  $M = 36$ ,  $SD = 12$  years old, range 19-81). The GL group comprised gun licence applicants undergoing neuropsychological revision with the DP-TC test and the control group comprised driving licence applicants. Individuals were not eligible for the study if they had changed their hand dominance due to intentional educational enforcement at school. Participation in study was voluntary.

### Instruments

The two instruments used were the Proprioceptive Diagnosis of Temperament and Character (DP-TC) test (Tous, 2008; Tous Ral, Muiños, Tous López, & Tous Roviroso, 2012), a proprioceptive test based on fine motor performance without vision of one's own body, and the EAE, a verbal personality test (Durán et al., 2001). This verbal test was used since it was the only verbal test standardized for obtaining a gun licence in the Spanish population. The EAE consists of 62 questions and measures the psychological characteristics that normally induce violent and antisocial behaviours, in four dimensions: Neuroticism, Paranoidism, Ego-Strength and Sensation Seeking. It was designed for professionals who are responsible for deciding whether a gun licence application should be accepted; at present, it is the only verbal test that has been standardized for this purpose.

<sup>1</sup> EAE is abbreviation from Spanish "Escala de Armas Española" (the Spanish Arms Scale).

<sup>2</sup> All participants had completed secondary school or vocational education modules.

The computerized DP-TC test was designed on the basis of the original manual version proposed by Emilio Mira (1958) and subsequently developed by Alice Mira (2002) as myokinetic psychodiagnosis (MKP). The computerized version improves the precision of the physical measurement of indicators, reduces experimental mortality (and therefore the consequent loss of data) and allows faster administration with fewer errors (Tous, Viadé & Muiños, 2007; Muiños, 2008; Tous Ral et al., 2012). In the studies carried out to develop the DP-TC, the exploratory factor analysis (Tous, Viadé & Muiños, 2007) and the subsequent confirmatory factor analysis (Muiños, 2008) showed that the instrument had six orthogonal bipolar factors:

- 1) *Mood* (from pessimism to optimism, with depression and mania at the poles);
- 2) *Decision-Making* (from submission to dominance, with inward and outward aggressiveness at the poles);
- 3) *Attention Style* (from inward to outward, with high self-absorption and high distraction for external stimuli at the poles);
- 4) *Emotionality* (from cold/distant to empathy/affiliation, with emotional instability at the empathy pole);
- 5) *Irritability* (from behavioural inhibition to behavioural excitability<sup>3</sup>);
- 6) *Impulsivity* (from rigidity to variability in behaviour).

The DP-TC test requires the following material: a) a tactile screen (LGE with resolution of 1280 x 1024 pixels and optimal frequency of 60 Hz) with a sensory stylus (for hand drawings); b) a laptop computer; c) specifically designed software for the recording and analysis of data; d) a piece of cardboard (or opaque screen) for the non-vision part of the test, serving to hide the active arm and movement feedback; e) a stool that can be adjusted to the participant's height, along with a table; and f) written and oral instructions for correct task procedure and performance (Tous Ral et al., 2012; Tous-Ral, Muiños, Liutsko, & Forero, 2012).

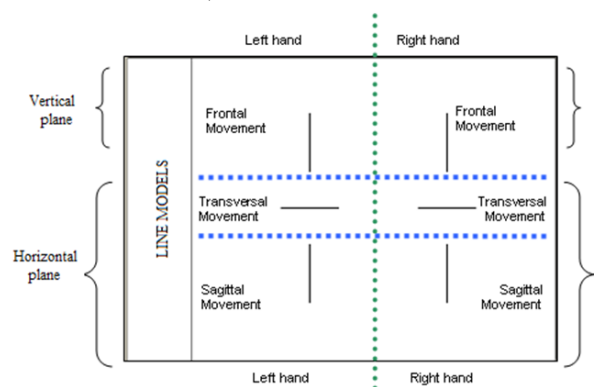
To reduce the effect of environmental factors the tests were administered in a silent laboratory, and subjects were instructed prior to the test ion not to consume any substances (such as coffee or drugs, etc.) that might affect fine motor activity. They were also instructed to adopt the posture that involved the least tension for upper limb movements.

All subjects gave their consent to participate after having been informed of the aims of the research. The study was approved by the Spanish Association of Medical and Aptitude Test Centres (ASECEMP), the Catalan Psychological Society (COPC) and the UB in accordance with the ethical standards of Helsinki Declaration.

## Procedure

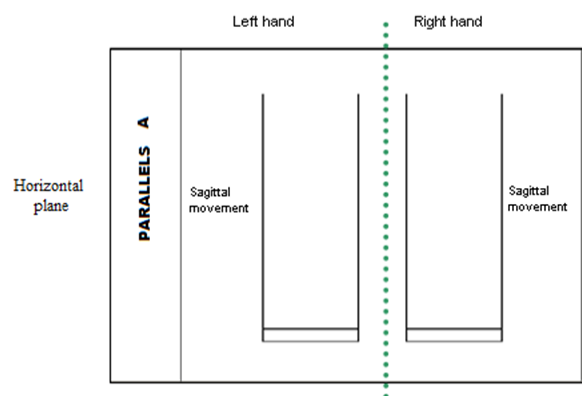
The precision of fine motor performance (hand drawings over the model lines) was measured in the following directions (Fig. 1a):

- 1) Transversal movements in an outward direction with a turn and return movement (horizontal lines in the horizontal position on the screen);
- 2) Sagittal movements in an outward direction with a turn and return movement (vertical lines in the horizontal position on the screen);
- 3) Frontal movements in an upward direction with a turn and return movement (vertical lines in the vertical position on the screen).



**Figure 1a.** Representation of DP-TC test task involving tracing over the line model: six lines measuring hand movements in three directions (transversal, sagittal and frontal) for both hands (right and left).

The ascendant and descendent parallels were applied as shown in Figures 1b and 1c in the horizontal position on the screen.



**Figure 1b.** Ascendant and descendent parallels in the DP-TC test.

In order to obtain reliable data, correct posture is required and stool and table heights have to be adjusted individually so as allow free elbow and arm movements. The following aspects must therefore be checked before and during task performance for both parts of the test (with and without vision): a) the subject's body should be in an upright position looking straight ahead (without leaning to the left or

<sup>3</sup> Impulsivity is to be considered as opposite to inhibition in verbal tests.

right when drawing) and with the feet together on the floor; b) the subject should be seated comfortably without having to bend his/her back or extend his/her arms in an unnatural way; c) the hand that is not being used in the task should rest on the leg ipsilateral to it; and d) the hand and arm used for the task should have no tactile contact with anything (except the stylus with which the drawing is performed) and the wrist must be kept rigid; the stylus should be held in the middle by the thumb and ring and index fingers, as when painting.

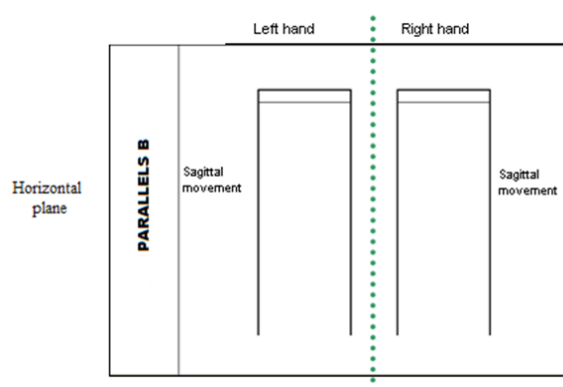


Figure 1c. Descendent parallels in the DP-TC test.

The dimensions of the DP-TC test are constructed as follows: Mood was obtained from errors in the vertical movement on the frontal plane and according to two poles: pessimism – optimism (Fig. 1a). Decision-Making was obtained from errors in the sagittal movement on the transverse plane and according to two poles: submission – dominance (Fig. 1a). Attention Style was obtained from horizontal movements in the transverse plane and according to two

poles: inward and outward (Fig. 1a). Emotionality was obtained from errors in horizontal movements on the vertical plane and according to two poles: no emotion and emotion (Fig. 1a). Irritability was obtained from errors in the lengths of all movements and planes, and according to two poles: inhibition - excitability (Fig. 1a). Impulsivity was obtained from the difference between the minimum and maximum lengths of movements in the parallels task, and according to two poles: Rigidity - Variability (Figs. 1b and 1c). The spatial errors made by participants in pixels were transformed into mm by DP-TC software, standardized for the Spanish population (Tous, 2008).

As the DP-TC test directly assesses the precision of the task performed, we calculated the index of difficulty for the GL group since we were interested in the personality profile of this population only. The difficulty index grades the response variables with respect to the means obtained by participants for each movement, so that the difficulty level is higher when participants make more errors.

### Data analysis

Data were analysed using SPSS v.16. Differences between the groups (GL vs. G) on the dimensions of the DP-TC test were assessed by means of a MANOVA, while a principal components analysis (with varimax rotation) was applied only to the GL group to determine how the variables of the DP-TC test and the verbal personality test were grouped in the factors.

### Results

The difficulty indexes are presented in Table 1.

Table 1. Distribution of DP-TC test performance in the GL group.

Dimensions	Type/Scale	<	N	>
1) Mood		pessimism	with precision or balanced	optimism
	T	65%	10%	25%
	C	74%	8%	18%
2) Decision-Making		submission	with precision or balanced	dominance
	T	15%	8%	77%
	C	12%	8%	80%
3) Attention Style		inward	with precision or balanced	outward
	T	51%	8%	41%
	C	47%	6%	47%
4) Emotionality		distant	with precision or balanced	affective
	T		11%	89%
	C		15%	85%
5) Irritability		inhibition	with precision or balanced	excitability
	T	55%	10%	35%
	C	67%	13%	21%
6) Impulsivity		rigidity	with precision or balanced	impulsivity
	T			100%
	C		2%	98%

Note: T = temperament; C = character.

Comparison of the results obtained on the DP-TC test by the GL and GP groups revealed the following differences for the six dimensions (Table 2):

- a) *For temperament:* The GL group scored significantly lower on the Mood dimension, with a bias towards greater pessimism, as well as on Decision-Making with a bias towards less aggressiveness. By contrast, the GL group scored significantly higher on Emotionality and Impulsivity.
- b) *For character:* The GL group scored significantly lower than the GP group on Decision-Making with a bias towards less aggressiveness and significantly higher on Impulsivity with a bias towards more variability in behaviour.

**Table 2.** MANOVA results for the six dimensions of the DP-TC test for the GL and GP groups.

Dimensions	Type/ Scale	GP: $M \pm SD$	GL: $M \pm SD$	<i>F</i>	<i>p</i>
1) Mood	T	-1.88±0.94	-4.57±0.90	4.27	.040
	C	-8.92±1.04	-6.11±1.00	3.80	.052
2) Decision-Making	T	14.23±1.01	9.43±0.98	11.65	<.001
	C	14.64±0.90	10.30±0.87	11.99	<.001
3) Attention Style	T	-1.06±1.19	-1.59±1.14	0.11	.743
	C	-0.28±1.07	1.59±1.03	1.57	.211
4) Emotionality	T	2.68±0.69	10.76±0.66	72.26	<.001
	C	7.54±0.59	8.07±0.57	0.42	.519
5) Irritability	T	39.17±0.93	38.64±0.89	0.17	0.679
	C	38.20±0.93	36.05±0.89	2.79	0.096
6) Impulsivity	T	13.97±0.79	18.28±0.76	15.28	<.001
	C	13.72±0.96	20.75±0.93	27.63	<.001

Note: T = temperament; C = character; GP - general population group; GL - gun licence applicants group.

Descriptive statistics of the verbal personality test for the gun licence group and the general population are presented in Table 3. There were no statistical differences between the groups on the Paranoidism scale, but statistical differences were recorded on the other verbal personality scales (Neuroticism, Sensation Seeking and Ego Strength).

**Table 3.** Descriptive statistics for Personality scale verbal test.

Dimensions	GP: $M \pm SD$	GL: $M \pm SD$
1) Neuroticism	10.20±6.50	5.51±5.28*
2) Paranoidism	4.70±4.30	3.73±3.49
3) Ego-Strength	8.75±4.50	6.93±4.11*
4) Sensation-Seeking	7.40±4.89	9.13±3.13*

Note: GP - general population group; GL - gun licence applicants group; \* - the difference is significant at  $p < .05$ .

In the GL group we then performed a principal components analysis (PCA) with varimax rotation for the six dimensions of the DP-TC test and the four dimensions of the verbal personality test. The Kaiser-Meyer-Olkin (*KMO*) index for Temperament was .55 ( $p < .0001$ ), with three factors accounting for 60% of the variance, while the *KMO* for Character was .60 ( $p < .0001$ ), with four factors accounting for 76% of the variance.

As regards the Temperament part of the DP-TC proprioceptive test and the dimensions on the EAE, three components were formed. The first included the verbal test dimensions Neuroticism, Paranoidism, Ego-Strength and Sensation-Seeking, along with the proprioceptive test dimension Irritability. The second component comprised only the DP-TC dimensions Emotionality, Decision-Making, Impulsivity and Irritability. Finally, the third component included the remaining DP-TC dimensions related to Temperament: Mood, Attention Style and Impulsivity (Table 4a).

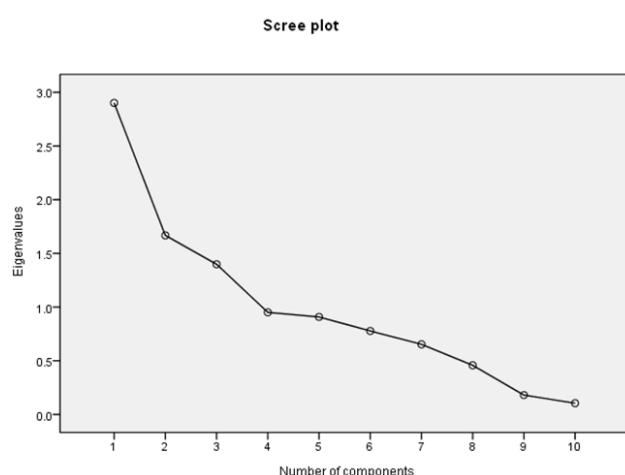
As regards the Character part of the proprioceptive test and the dimensions on the EAE, four components were formed. The first comprised the verbal test dimensions Neuroticism, Paranoidism and Ego-Strength, and the DP-TC dimension Emotionality. The second component consisted of the DP-TC dimensions Impulsivity, Irritability and Decision-Making, and the verbal test dimension Sensation-Seeking. The third component comprised the DP-TC dimensions Mood, Emotionality, Irritability and Attention Style and the verbal test dimension Sensation-Seeking. And finally, the fourth component was represented by Attention Style in the proprioceptive test and the verbal test dimension Sensation-Seeking (Table 4b).

**Table 4a.** PCA with varimax rotation, showing the loading for each of the identified components when considering the Temperament dimensions of the DP-TC test, together with the Personality scale test dimensions.

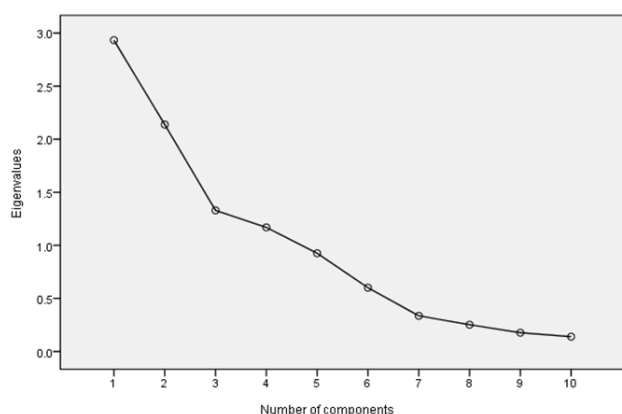
	Component		
	1	2	3
Mood T	.13	-.01	<b>-.81</b>
Decision-Making T	.13	<b>.64</b>	.02
Attention Style T	.16	-.06	<b>.76</b>
Emotionality T	-.04	<b>.74</b>	-.21
Irritability T	<b>-.41</b>	<b>.53</b>	-.19
Impulsivity T	-.04	<b>.65</b>	<b>.32</b>
Neuroticism	<b>.92</b>	-.01	.12
Paranoidism	<b>.91</b>	.07	.15
Sensation-Seeking	<b>-.38</b>	.10	.10
Ego-Strength	<b>.89</b>	.06	-.05

**Table 4b.** PCA with varimax rotation, showing the loading for each of the identified components when considering the Character dimensions of the DP-TC test, together with the Personality scale test dimensions.

	Component			
	1	2	3	4
Mood C	.16	-.20	<b>-.54</b>	-.13
Decision-Making C	.04	<b>.75</b>	.10	.19
Attention Style C	-.01	-.06	<b>.35</b>	<b>.88</b>
Emotionality C	<b>.42</b>	-.12	<b>.73</b>	.05
Irritability C	-.23	<b>.56</b>	<b>.62</b>	-.09
Impulsivity C	.16	<b>.91</b>	.04	-.07
Neuroticism	<b>.92</b>	.00	-.05	-.09
Paranoidism	<b>.92</b>	.05	-.02	-.07
Sensation-Seeking	-.23	<b>.35</b>	<b>-.41</b>	<b>.67</b>
Ego-Strength	<b>.92</b>	.08	.07	-.01



**Figure 2a.** Scree plot derived from the PCA for the Temperament dimensions of the DP-TC test and the Personality scale test dimensions.



**Figure 2b.** Scree plot derived from the PCA for the Character dimensions of the proprioceptive test DP-TC and the Personality scale verbal test dimensions.

## Discussion and Conclusions

One of the conclusions to be drawn from the proprioceptive DP-TC test results is that, in terms of their personality profile, the gun licence applicants were significantly more pessimistic (in Temperament) and more impulsive (in both Temperament and Character) than participants from the general population. These findings may be related to the results of the study by Wintemute (2011), who found a high risk of heavy alcohol consumption in fire arms owners. The results for Sensation seeking in the verbal test were also higher, which may be consistent with behavioural Impulsivity in the proprioceptive test.

Gun licence applicants also scored higher on Emotionality (in Temperament) and lower on Decision-Making (lower aggressiveness). In the principal components analysis (PCA) for Character, the results for the first component showed that high scores on Emotionality were related to high Neuroticism, Paranoidism and Ego-Strength.

Among the three verbal test dimensions related to the proprioceptive dimension Emotionality, the low scores obtained for Ego-Strength by the applicants for gun licences group were as expected, since low Ego-Strength indicates that the person is less secure, more sensitive and affective and has higher levels of anxiety and vulnerability. Paranoidism did not show significant differences between the two groups. Neuroticism scores in the GL group were significantly lower than in the general population, which may signify that the applicants for gun licences who participated in this study were more emotionally stable (for instance, they may all have been applying for the purposes of hunting, rather than for their own protection). However, the results for the proprioceptive dimension Emotionality in the Character assessment (more related to conscious and verbal assessment: left hemisphere) showed no significant differences in performance between the two groups, whereas in the Temperament assessment (more related to the unconscious: right hemisphere) the gun licence applicants scored higher, showing emotional immaturity at a more biological level, although they presented the same emotional self-control as the general population group (reflected by the Character scores). Nevertheless, scores on the Neuroticism dimension in the verbal test showed that the GL considered themselves to be significantly more stable than the GP group; this may reflect their own inadequate assessment of their dispositional behaviour (Temperament) compared with their intentional behaviour (Character) and raises the possibility that they fake the results of the verbal test in order to obtain the licence. Their verbal self-assessment of Ego-strength was significantly lower than the general population group, indicating more anxiety and insecure behaviour; this was consistent with the proprioceptive test results, since a part of the Emotionality scale is also related to Decision-making (submission-dominance), showing a tendency in both Temperament and Character behavioural tendencies towards submission (less dominance) and less assertive behaviour.

Compared with other studies by our group on motor expressive indicators of violence (Tous, Viadé, Chico & Muñoz, 2002; Tous, Viadé, & Chico, 2003) performed in violent in-mates and non-violent students, we see that the gun licence applicants resemble violent in-mates in presenting high Emotionality (only in Temperament) and high Impulsivity. However, other proprioceptive expressive indicators were at opposite extremes: in the Mood scale, the violent in-mates showed a tendency towards the manic pole whereas the gun licence applicants showed a tendency towards depression; and in the Decision-making scale, violent subjects had a tendency towards dominance, whereas the GL group tended towards submission. Moreover, while the gun licence applicants had slightly but not significantly higher scores on the Irritability dimension in the DP-TC test, in the violent in-mates the difference in Irritability scale scores was statistically significant. Another study (Tous, Viadé & Muñoz, 2002) found that sharpshooters had higher scores on Irritability (showing more Excitability only in Character) and in

Decision-making, with a tendency towards dominance (in Character), similar to violent in-mates; however, they were less depressive, but not manic on the Mood scale (Temperament) and had higher emotional control (Emotionality scale) than the students. In the comparative study of motor expressiveness without vision in three groups (students, policemen and in-mates), the following distinctive features were seen in each group: 1) the students were more depressive; 2) the in-mates were more dominant, and 3) the policemen had better emotional control (Tous, Muiños, Chico, Pont, & Viadé, 2003).

In the current study, the results of the PCA of the DP-TC test and the verbal personality test showed little (only in the first component) or no relationship between temperamental variables of the proprioceptive test and variables of the verbal test. The results thus confirm that temperament had no or little social influence. However, the character dimensions of the proprioceptive test did show a relationship with some verbal test variables, which is consistent with the

conceptual definition of character as the result of an interaction between temperament and a given social environment. Thus, another indirect conclusion of this experimental study is that proprioceptive assessment (DP-TC) provides important information to complement the data obtained by the verbal test. It also offers a series of advantages, as it is independent of, and complementary to, verbal tests of personality, it is impossible to fake, and it can be used in different cultures without adaptation. However, we should stress that although the personality profile obtained is very useful for the study of individual differences of applicants for gun licences, information on their history of accidents is also required in order to decide whether or not they are fit to possess a firearm.

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## References

- Corr, P. J. (2010). Automatic and Controlled Process in Behavioural Control: Implications for Personality Psychology. *Eur. J. Pers.*, *24*, 376-403.
- Dennis, C. (2006). *Sixth sense can come from within*. Retrieved from <http://www.nature.com/news/2006/060320/full/news060320-5.html>. Doi: 10.1038/news060320-5.
- Durán, R., García, E., García, J., & Martínez, M. (2001). *EAE. Escala de personalidad*. [Scale of personality]. Madrid: Instituto de Orientación Psicológica, EOS.
- Fortuny, R. (2008). *Avaluació ideomotora en una escola d'Educació especial i d'Educació Ordinària* [Ideomotor assessment in secondary schools with special and ordinary educations]. (Unpublished Master thesis). Barcelona: University of Barcelona.
- González, A. (2009). *Proyecto permis d'armes del Col·legi Oficial de Psicòlegs de Catalunya* [Project of gun licences of Catalanian Psychological Official College]. Consejo general de Colegios Oficiales de Psicólogos: Área de Psicología de Tráfico y Seguridad.
- Ingram, H. A., van Donkelaar, P., Cole, J., Vercher, J. L., Gauthier, G. M., & Miail, R.C. (2000). The role of proprioception and attention in a visuomotor adaptation task. *Experimental Brain Research*, *132*(1), 114-126. Doi: 10.1007/s002219900322.
- Kagan, J. (2005). A time for specificity. *Journal of Personality Assessment*, *85*, 125-127. Doi: 10.1207/s15327752jpa8502\_03.
- Kleck, G. (1991). Point blank: guns and violence in America. New York: Aldine de Gruyter. Retrieved from <http://www.catb.org/esr/guns/point-blank-summary.html>.
- Mira, E. (1958). *M. K. P. Myokinetic Psychodiagnosis*, New York: Logos Press.
- Mira, A. M. G. (2002). *PMK. Psicodiagnóstico Miocinético* [MKP. Miokinetic Psychodiagnosis], Brasil: San Paolo, Vector.
- Muiños, R. (2008). *Psicodiagnóstico Miocinético: Desarrollo, descripción y análisis factorial confirmatorio* [Miokinetic Psychodiagnosis: Evolution, description and factorial confirmatory analysis]. (PhD thesis). Barcelona: University of Barcelona. Retrieved from <http://www.tdx.cat/handle/10803/2543>.
- Osterrieth, P. A. (1944). Filistest de copie d'une figure complex: Contribution à l'étude de la perception et de la mémoire [The test of copying a complex figure: A contribution to the study of perception and memory]. *Archives de Psychologie*, *30*, 286-356.
- Rey, A. (1941). L'examen psychologique dans les cas d'encéphalopathie traumatique. (Les problems). *Archives de Psychologie*, *28*, 215-285.
- Rosenbaum, D. A. (2005). The Cinderella of Psychology: The Neglect of Motor Control in the Science of mental life and behavior. *American Psychologist*, *60*(4), 308-317. Doi: 10.1037/0003-066X.60.4.308.
- Tous, J. M., Viadé, A., Chico, E. & Muiños, R. (2002a, November) Aplicación del Psicodiagnóstico Miocinético revisado (PMK-R) al estudio de la violencia. Paper presented at the *III Congreso Iberoamericano de Psicología clínica y Salud*, Caracas, Venezuela.
- Tous, J. M., Viadé, A., & Muiños, R. (2002b, November). *Rendimiento en los lineogramas del PMK-R, en un grupo de tiradores de élite y un grupo de universitarios*. [Performance on lineograms of MKP-R, in a group of elite sharpshooters and a group of university students]. Paper presented at the *III Congreso Iberoamericano de Psicología clínica y Salud*, Caracas, Venezuela.
- Tous, J. M., Muiños, R., Chico, E., Pont, N., & Viadé, A. (2003, April). *Diferencias motoras de personalidad en presos, policías y universitarios, según el PMK-D*. [Motor differences in personality of prisoners, police and university students, according to the MKP-D]. Poster presented at the *II Congreso Nacional de Psicología de la Sociedad Española para la Investigación de las Diferencias Individuales*, Barcelona, Spain.
- Tous, J. M., Viadé, A., & Chico, E. (2003). Aplicación del psicodiagnóstico miocinético revisado (PMK-R) al estudio de violencia. *Psicothema*, *15*, 253-259.
- Tous, J. M., Viadé, A. & Muiños, R. (2006, June). *Structural validity of Myokinetic Psychodiagnosis Revised (MKP-R) lineograms*. Paper presented at the *13th European Conference on Personality*, Athens, Greece.
- Tous, J. M., Viadé, A., & Muiños, R. (2007). Validez estructural de los lineogramas del psicodiagnóstico mio cinético, revisado y digitalizado (PMK-RD) [Structural validity of miokinetic psychodiagnosis-revised and digitalized (MKP-RD) lineograms]. *Psicothema*, *19*(2), 350-356.
- Tous, J.M. (2008). *Diagnóstico Proprioceptivo del Temperamento y el Carácter DP-TC (versión 1)*. [Computer software]. Barcelona: Lab. Mira y López, University of Barcelona. Access for use the test is <http://www.edp.com.es/default/Inicio-es.html>.
- Tous, Ral, J. M., Muiños, R., Tous López, O., & Tous Roviro, J. M. (2012). *Diagnóstico proprioceptivo del temperamento y el carácter* [Proprioceptive Diagnosis of Temperament and Character]. Barcelona: Ediciones y Publicaciones de la Universidad de Barcelona.
- Tous-Ral, J.M., Muiños, R., Liutsko, L., & Forero, C. G. (2012). Effects of sensory information, movement direction, and hand use on fine motor precision. *Perceptual and Motor Skills*, *115*(1), 261-272. Doi:10.2466/25.22.24.PMS.115.4.261-272
- Van Beers, R. J., Sittig, A. C., & Denier van der Gon, J. J. (1998). The precision of proprioceptive position sense. *Experimental Brain research*, *122*, 367-377. Doi:10.1007/s002210050525.
- Wintemute, G. J. (2011). Association between firearm ownership, firearm-related risk and risk reduction behaviours and alcohol-related risk behaviours. *Inj Prev*, *17*, 422-427. Doi:10.1136/ip.2010.031443

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