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Modificación del cuestionario de síntomas neurotóxicos (Q16)

Modified Q16 Neurotoxic Symptoms Questionnaire

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RESUMEN

Objetivo: modificar el cuestionario de síntomas neurotóxicos (Q16) y evaluar su repetibilidad y comparabilidad. *Metodología:* un grupo de cien participantes entre los dieciocho y los cuarenta años con un nivel educativo equivalente a bachillerato o formación técnica, aproximadamente similar al nivel de educación de los trabajadores de lavandería de Bogotá, fue empleado para validar el cuestionario en Sídney, Australia. Tres cuestionarios y uno sobre información demográfica fueron aplicados a los participantes. El cuestionario Q16 modificado fue aplicado dos veces para evaluar su repetibilidad. *Resultados:* sesenta hombres y cuarenta mujeres participaron en el estudio. Para analizar la confiabilidad del cuestionario Q16 modificado fue aplicado el Alfa de Cronbach, obteniéndose un coeficiente de consistencia interna alfa de 0,887. Para evaluar la repetibiliad Se aplicó el test de t pareada, obteniéndose diferencias significativas en dos preguntas con valores p = 0,027 y p = 0,020, respectivamente. Comparando los resultados de la escala de Likert con el original se observaron relaciones directas entre los mismos. *Conclusiones:* el cuestionario modificado Q16 brinda más opciones de respuesta con mayor acercamiento a la realidad, consistencia interna y repetibilidad. El cuestionario modificado Q16 puede ser una mejor opción para evaluar los síntomas neurotóxicos.

Palabras clave: cuestionarios, síntomas neurotóxicos.

ABSTRACT

Objective: To modify the neurotoxic symptoms questionnaire (Q16) and assess its repeatability and comparability. *Materials and Methods:* A group of 100 participants ranging from the ages of 18 to 40, with an education level equivalent to high school or technical college, similar to the education level of dry-cleaners in Bogotá was used to validate the questionnaire in Sydney, Australia. Three test questionnaires and a demographic information questionnaire were presented to participants. The modified Q16 was applied twice in order to evaluate repeatability. *Results:* Sixty males and forty females participated in the study. Cronbach's Alpha was applied in order to analyze the reliability of the Q16 modified with a Likert scale, getting an internal consistency of 0.887. The paired t test was applied in order to evaluate repeatability, obtaining significant differences in two questions with p=0.027 and p=0.020 values, respectively. Comparing the results of the Likert scale scores with the original, a direct link was observed between them. *Conclusions:* The modified Q16 provides more answer choices, closer to reality, internal consistency and repeatability. The modified Q16 may be a better option to assess neurological symptoms.

Keywords: Questionnaire, Neurotoxic symptoms.

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INTRODUCCIÓN

Los solventes orgánicos pueden causar depresión del sistema nervioso central (SNC) (World Health Organization, 1985; Candura, 1991; Cherry et ál., 1980; Xintaras et ál., 1984; Anger et ál., 1999), por lo tanto, la evaluación de síntomas neurológicos es importante en la prevención de enfermedades neurológicas agudas y crónicas.

Cuestionarios de tamizaje (Q16, entre otros) pueden tener resultados positivos de diferentes maneras. Por ejemplo, con el cuestionario Q16 se puede facilitar la detección temprana de personas que sufren efectos a causa de su exposición a solventes orgánicos. Así, esta intervención puede ser hecha para reducir o eliminar su exposición a solventes o recibir tratamiento cuando otros factores fueren la causa del problema. El cuestionario Q16 contiene dieciséis preguntas validadas acerca de síntomas de neurotoxicidad (Hogstedt et ál., 1984). La comprensión de las preguntas fue investigada por médicos y psicólogos. La confiabilidad fue evaluada realizando procedimientos de prueba y reprueba. La validez fue evaluada investigando el poder de las preguntas o discriminando entre grupos de expuestos y no expuestos, además, por la comparación de grupos con y sin "síndrome psicoorgánico". El estudio sugiere realizar valoraciones médicas cuando cuatro o más síntomas son reportados por jóvenes de hasta veintiocho años de edad o cuando seis o más síntomas son reportados por mayores de veintiocho años (Hogstedt et ál., 1984).

Lundberg et ál. (1997) aplicaron el cuestionario Q16 para analizar síntomas neurotóxicos presentes en trabajadores expuestos a solventes orgánicos. Este cuestionario fue útil para realizar comparación de grupos con diferentes exposiciones a solventes orgánicos. La prevalencia de personas con más de seis síntomas en el cuestionario Q16 se relaciona con el incremento acumulativo por exposición a solventes. El estudio sugiere que el cuestionario es un instrumento sensible para detectar grupos con alta exposición a solventes orgánicos, así como por exposición previa. El cuestionario Q16 ha sido traducido y validado en diferentes idiomas, como alemán, francés, noruego y español (Rodezno et ál., 1995; Lundberg et ál., 1997; Ihrig et ál., 2003; Dick, 2006).

MATERIALES Y MÉTODOS

El cuestionario Q16 (versiones en inglés y español) provee opciones de respuestas de sí/no, siendo las respuestas de los individuos no muy claras. Como se buscaba una mayor precisión en las respuestas de los participantes, se consideró modificar el cuestionario Q16 de la forma binaria de repuesta (sí/no) a respuestas considerando la escala de Likert (con 5 niveles de respuesta) y evaluar su repetibilidad. Esta investigación fue aprobada por el comité de ética de la Universidad de New South Wales obteniéndose aprobación número 1006 antes de que el reclutamiento de sujetos iniciara. Cada participante emitió su consentimiento informado por escrito antes después de que los riesgos y beneficios del estudio y los procedimientos fueran ampliamente explicados.

Muestra

Un grupo de cien participantes entre dieciocho y cuarenta años de edad con nivel educativo de bachillerato o formación técnica quienes tuvieran trabajos del mismo nivel que un trabajador de lavandería de Bogotá, fueron reclutados para aplicar y probar el cuestionario en Sídney, Australia.

El procesamiento de reclutamiento de sujetos de investigación fue el siguiente: una carta fue enviada al Consejero de Recursos Humanos de The University of New South Wales solicitando su colaboración para dar a conocer la necesidad de contar con voluntarios para la investigación, procedentes del grupo de servicios generales, quienes cumplieran con el nivel educativo. A las personas interesadas se les solicitaba contactar a los investigadores directamente por teléfono o correo electrónico para obtener los cuestionarios. Además, amigos de estos participantes podían ser también

incluidos, siempre y cuando cumplieran con el criterio de inclusión.

Método

Tres cuestionarios a evaluar (ver apéndice A) y un cuestionario sobre información demográfica (ver apéndice B) fueron enviados a los participantes. Primero, se les solicitó brindar su información demográfica y de salud general. Luego se les solicitó completar los cuestionarios 1 y 2 el día en que los recibían y el cuestionario 3 debería ser diligenciado una semana después. Entonces, los tres cuestionarios, una vez diligenciados, más el de información demográfica debían ser devueltos al investigador. Se diseñó una guía con las instrucciones sobre cómo diligenciar los cuestionarios para ayudar al participante a entender la metodología y además se le solicitó seguir los pasos establecidos ordenadamente. El primer cuestionario era el cuestionario modificado Q16, el segundo cuestionario era el original Q16 y el tercero era de nuevo el Q16 modificado. El cuestionario Q16 modificado fue aplicado dos veces para evaluar su repetividad.

RESULTADOS

Caracterización de la muestra

El grupo participante de la investigación estaba constituido por sesenta hombres y cuarenta mujeres. El 29% se encontraba entre los veintitrés y los veintisiete años; 28%, entre los veintiocho y los 32, y 24%, entre los 33 y los 37 años.

Información demográfica

Un sujeto reportó sufrir diabetes; uno, hipertensión; cinco, cáncer; dos, enfermedades neurológicas, como epilepsia, y diecinueve personas, ansiedad.

El 20% eran fumadores; 54% eran consumidores de bebidas alcohólicas. El 13% tomaba medicamentos por problemas como alergias, infecciones e inflamación.

Respuestas cuestionario modificado con escala de Likert, primera medición

Se utilizó el paquete estadístico SPSS© (versión 18.0) para analizar los datos recolectados. Para analizar la confiabilidad del cuestionario modificado Q16 utilizando la escala de Likert, fue aplicado el Alfa de Cronbach (ver tabla 1).

tabla 1. **Resultados Alfa de Cronbach para la escala de Likert**

Alpha de Cronbach	Alpha de Chronbach Basado en ítems estándar	Nº de ítems
0,887	0,889	16

Fuente: elaboración propia

El coeficiente alfa para 16 preguntas es de 0,887, lo que muestra una alta consistencia interna (teniendo en cuenta que un coeficiente de confiabilidad superior a 0,70 se considera aceptable para investigaciones).

La prueba *t* pareada fue aplicada para analizar las diferencias entre la primera y segunda medición de la versión modificada del Q16. La pregunta número 15 ("Siento que tengo menos sensibilidad o una completa pérdida de sensibilidad en algunas partes de mis brazos o piernas") y la pregunta 16 ("A menudo me despierto y tengo problemas para volver a dormir de nuevo") presentaron diferencias significativas, $p = 0,03$ y $p = 0,02$, respectivamente. Estos resultados muestran que la escala de Likert utilizada en la modificación del cuestionario Q16 es repetible y da confiabilidad al cuestionario (tabla 2).

Comparación entre las respuestas binarias (sí/no) en el cuestionario Q16 original y el Q16 modificado

Para analizar los datos recolectados fue utilizado el paquete estadístico SPSS© (versión 18.0). Para conocer la relación existente entre las respuestas dadas en el cuestionario original Q16 y compararlas con las respuestas dadas al Q16 modificado se utilizó el análisis descriptivo del programa SPSS.

TABLA 2. **Resultados prueba *t* pareada**

	Paired differences					T	DF	Sig. (2-tailed)
	Mean	Std. deviation	Std. error mean	95% confidence interval of the difference				
				Lower	Upper			
Pair 1 LiQ1 - LisecQ1	0,040	0,549	0,055	-0,069	0,149	0,729	99	0,468
Pair 2 LiQ2 - LicsecQ2	0,070	0,432	0,043	-0,016	0,156	1,619	99	0,109
Pair 3 LiQ3 - LicsecQ3	-0,050	0,411	0,041	-0,132	0,032	-1,216	99	0,227
Pair 4 LiQ4 - LicsecQ4	-0,040	0,567	0,057	-0,153	0,073	-0,705	99	0,482
Pair 5 LiQ5 - LicsecQ5	0,010	0,577	0,058	-0,105	0,125	0,173	99	0,863
Pair 6 LiQ6 - LicsecQ6	-0,060	0,397	0,040	-0,139	0,019	-1,510	99	0,134
Pair 7 LiQ7 - LicsecQ7	-0,030	0,540	0,054	-0,137	0,077	-0,555	99	0,580
Pair 8 LiQ8 - LicsecQ8	0,090	0,514	0,051	-0,012	0,192	1,75	99	0,083
Pair 9 LiQ9 - LicsecQ9	0,070	0,590	0,059	-0,047	0,187	1,186	99	0,239
Pair 10 LiQ10 - LicsecQ10	0,060	0,633	0,063	-0,066	0,186	0,948	99	0,345
Pair 11 LiQ11 - LisecQ11	0,040	0,511	0,051	-0,061	0,141	0,783	99	0,436
Pair 12 LiQ12 - LicsecQ12	0,020	0,402	0,040	-0,060	0,100	0,498	99	0,620
Pair 13 LiQ13 - LicsecQ13	-0,030	0,332	0,033	-0,096	0,036	-0,904	99	0,368
Pair 14 LiQ14 - LicsecQ14	-0,010	0,522	0,052	-0,114	0,094	-0,192	99	0,849
Pair 15 LiQ15 - LicsecQ15	-0,110	0,490	0,049	-0,207	-0,013	-2,244	99	0,027
Pair 16 LiQ16 - LicsecQ16	-0,160	0,677	0,068	-0,294	-0,026	-2,362	99	0,020

Fuente: elaboración propia

Considerando los puntajes de la escala de Likert: 1 (totalmente en desacuerdo), 2 (en desacuerdo), 3 (neutral), 4 (de acuerdo), 5 (totalmente de acuerdo), y la relación con las respuestas positivas (sí) o negativas (no), los resultados muestran que cuando una persona responde "sí" el puntaje se encuentra entre el valor de 3 (neutral), 4 (de acuerdo) y 5 (totalmente de acuerdo). Mientras que cuando una persona responde "no", la tendencia del puntaje es hacia 1 (totalmente en desacuerdo) o 2 (en desacuerdo). No obstante, un par de casos (n = 2) mostraron un comportamiento inverso. Se puede decir que quizás estos dos participantes estaban distraídos cuando respondieron los cuestionarios.

La tendencia muestra que los sujetos pueden encontrar más fácil el uso de la escala de Likert con más opciones de respuesta que si ellos debieran forzar sus respuestas y ajustarlas dentro de dos opciones, en este caso, "sí" o "no".

Por lo tanto, considerando estas comparaciones y los análisis estadísticos, se puede considerar que la versión modificada del cuestionario Q16 puede brindar mayor información acerca de la evaluación de síntomas neurotóxicos.

DISCUSIÓN

Teniendo en cuenta los resultados del cuestionario modificado Q16, y comparándolos con los del original (Lundberg et ál., 1997), la escala de Likert puede ser considerada como una buena herramienta para medir y comparar síntomas reportados sobre una serie de preguntas afirmativas con mayor precisión que con tipos de respuesta sí/no, y aun mayor facilidad de evaluación con preguntas cerradas (Shank y Bircher, 2009).

Forzar artificialmente las respuestas entre un formato sí/no puede reducir las diferencias indivi-

duales, hacer que se pierda la fuerza de lo que se cree (ser débil al responder), introducir errores sistemáticos y cohibir a los sujetos para responder lo que ellos originalmente desearían (Chandler y Patterson, 1976).

De acuerdo con Brehm (1966, en la teoría de la reactancia psicológica, cualquier percepción, amenaza o pérdida de la libertad motivacionalmente despierta al individuo a la resistencia, haciendo que lo que había decidido inicialmente no sea evidenciado. Si un sujeto está de acuerdo con dar su respuesta, pero se ve obligado a responder de manera inequívoca con un "sí" o un "no", este sujeto puede tener la tendencia a responder sin sinceridad o a evitar responder de forma aleatoria, o simplemente negarse a responder.

El cuestionario modificado Q16 muestra una excelente consistencia interna (0,887) (Nunnally y Bernstein, 1994). Además, la mayoría de sus preguntas muestran buena repetibilidad. De dieciséis preguntas, solo dos presentaron una diferencia significativa en el test de *t* pareada. Quizás estas dos preguntas pudieron verse afectadas por comportamientos pasajeros de los participantes, como, por ejemplo, somnolencia, distracción o fatiga mental, entre otros.

Teniendo en cuenta las comparaciones y los análisis estadísticos, se puede considerar la versión modificada del cuestionario Q16 como una mejor opción para conocer síntomas neurológicos, dado que los individuos no tienen que forzar sus respuestas o enmarcarlas en dos opciones únicas de respuesta.

CONCLUSIONES

Utilizar la escala de Likert en el cuestionario Q16 da más proximidad a las respuestas reales que un sujeto quiere dar. La versión modificada del cuestionario de síntomas neurotóxicos Q16 da a los sujetos más opciones para expresar sus sentimientos y brindar mayor acercamiento a la realidad, consistencia interna y repetibilidad.

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APÉNDICE A

THE UNIVERSITY OF NEW SOUTH WALES

DATE OF COMPLETION_____ ID Number_____

NEUROTOXIC SYMPTOMS QUESTIONNAIRE Q16 – NUMBER 1

Nº	Statement	Scale				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	I have a short memory					
2	My relatives and/or friends have told me that I am forgetful					
3	I forget activities that I consider important					
4	I generally find it hard to get the meaning of the news, programs, or fiction series that I watch on TV or listen to on the radio					
5	I have problems with concentrating					
6	I often feel irritated without any reason					
7	I often feel depressed or sad without any particular reason					
8	I have problems deciding to do activities I know I must do					
9	I feel abnormally tired					
10	Sometimes I feel an oppression of my chest					
11	I have had a sudden sensation of falling down while standing or walking					
12	I often have a painful tingling in some part of my body					
13	I have problems with buttoning or unbuttoning my clothes					
14	I feel that I have lost strength in my arms or legs					
15	I feel that I have less sensitivity or a complete loss of sensitivity in some parts of my arms or legs					
16	I often wake up and then have problems getting back to sleep again					

THE UNIVERSITY OF NEW SOUTH WALES

DATE OF COMPLETION_____ ID Number_____

NEUROTOXIC SYMPTOMS QUESTIONNAIRE Q16 –NUMBER 2

N°	Question	Scale	
		Yes	No
1	Do you have a short memory?		
2	Have your relatives and/or friends have told you that you are forgetful?		
3	Do you often forget activities that you consider important?		
4	Do you generally find it hard to get the meaning of the news, programs, or fiction series that I watch on TV or listen to on the radio?		
5	Do you have problems with concentrating?		
6	Do you often feel irritated without any reason?		
7	Do you often feel depressed or sad without any particular reason		
8	Do you have problems deciding to do activities I know you must do?		
9	Are you abnormally tired?		
10	Do you sometimes feel an oppression of your chest?		
11	Have you had a sudden sensation of falling down while standing or walking?		
12	Do you often have a painful tingling in some part of your body?		
13	Do you have problems with buttoning or unbuttoning your clothes		
14	Do you feel that I have lost strength in my arms or legs?		
15	Do you feel less sensitivity or a complete loss of sensitivity in some parts of your arms or legs?		
16	Do you often wake up and then have problems getting back to sleep again?		

THE UNIVERSITY OF NEW SOUTH WALES

DATE OF COMPLETION_____ ID Number_____

NEUROTOXIC SYMPTOMS QUESTIONNAIRE Q16 – NUMBER 3

Nº	Statement	*SCALE*				
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	I have a short memory					
2	My relatives and/or friends have told me that I am forgetful					
3	I forget activities that I consider important					
4	I generally find it hard to get the meaning of the news, programs, or fiction series that I watch on TV or listen to on the radio					
5	I have problems with concentrating					
6	I often feel irritated without any reason					
7	I often feel depressed or sad without any particular reason					
8	I have problems deciding to do activities I know I must do					
9	I feel abnormally tired					
10	Sometimes I feel an oppression of my chest					
11	I have had a sudden sensation of falling down while standing or walking					
12	I often have a painful tingling in some part of my body					
13	I have problems with buttoning or unbuttoning my clothes					
14	I feel that I have lost strength in my arms or legs					
15	I feel that I have less sensitivity or a complete loss of sensitivity in some parts of my arms or legs					
16	I often wake up and then have problems getting back to sleep again					

APÉNDICE B

Demographic information

Q1: Age (years):
- ☐ 18 – 22 ☐ 23 – 27
- ☐ 28– 32 ☐ 33 – 37
- ☐ 38– 42 ☐ 38-40

Q2: Gender:
- ☐ Male
- ☐ Female

Q3: Do you suffer from Diabetes?
- ☐ No
- ☐ Yes

Q4: Do you suffer from Hypertension?
- ☐ No
- ☐ Yes

Q5: Do you suffer from cancer?
- ☐ Yes
- ☐ No

Q6: Do you suffer from any neurological disease? Please if *yes*, state the name of the disease.
- ☐ No
- ☐ Yes

Name of the disease:_____

Q7: Do you suffer of anxiety or depression?
- ☐ No
- ☐ Yes

Q8: Do you smoke? if *yes*, answer question number 9
- ☐ No
- ☐ Yes

Q9-: How many cigarettes you smoke per day?
- ☐ 0-4 ☐ 5-9
- ☐ 10-14 ☐ 15-19
- ☐ ≥ 20

Q10-: How many cigars you smoke per day?
- ☐ 0-4 ☐ 5-9
- ☐ 10-14 ☐ 15-19
- ☐ ≥ 20

Q11: Do you drink alcohol? if *yes*, answer question number 13
- ☐ No
- ☐ Yes

Q12-: How many alcoholic drinks you drink per day?
- ☐ 0-4 ☐ 5-9
- ☐ 10-14 ☐ 15-19
- ☐ ≥ 20

Q13: Do you take medication? If *yes*, answer question number 15
- ☐ No
- ☐ Yes

Q14-: What it is for?
- ☐ Infections
- ☐ Diabetes
- ☐ Hypertension
- ☐ Allergies
- ☐ AINES
- ☐ Corticoids
- ☐ Other (Specify) _____

DATE OF COMPLETION_____ID Number_____

Baseline Survey

DEMOGRAPHIC AND GENERAL HEALTH INFORMATION: Please tell us some basic information about yourself

Este aparte es directamente al comienzo de la encuesta de base, no al final como aparece aquí.

Modified Q16 Neurotoxic Symptoms Questionnaire

Modificación del cuestionario de síntomas neurotóxicos (Q16)

INTRODUCTION

Organic solvents can cause depression in the CNS (Central Nervous System) (World Health Organization, 1985) (Candura, 1991) (Cherry, Waldron et al., 1980; Xintaras, Johnson et al., 1984; Anger, Rohlman et al., 1999). As a result, evaluating neurological symptoms is important to prevent acute and chronic neurological diseases.

Questionnaire screening (e.g. Q16) may result in several positive effects. For instance, screening with a Q16 questionnaire can facilitate early detection of individuals suffering organic solvent related effects, so that intervention can be made to reduce or eliminate their exposure to solvents or receive treatment when other factors are the cause of their distress. The Q16 contains 16 validated questions regarding symptoms of neurotoxicity (Hogstedt et al., 1984). The understanding of the questions was investigated by physicians, psychologists, and workers. Reliability was studied by test-retest procedures. Validity was evaluated by investigating the power of the questions to discriminate between exposed and non-exposed groups and by comparisons of groups with and without a "psycho-organic syndrome". Further evaluation is indicated when four or more symptoms are reported by people younger than 28 years of age or when six or more symptoms are reported by those older than 28 (Hogstedt et al., 1984).

Lundberg et al. (1997) applied the Q16 questionnaire to analyse neurotoxic symptoms that may be present in workers exposed to organic solvents. This questionnaire was useful for comparison between groups with different exposures to organic solvents. The prevalence of people with more than six symptoms in the Q16 questionnaire rose with an increasing cumulative exposure to solvents. The study suggests that the questionnaire is a sensitive instrument to detect groups with high exposure to organic solvents among currently, as well as previously exposed workers. The Q16 questionnaire has been translated and validated to different languages such as German, French, Norwegian and Spanish (Rodezno, Lundberg et al., 1995; Lundberg, 1997; Ihrig, 2003; Dick, 2006).

MATERIALS AND METHODS

The Q16 questionnaire (Spanish and English versions) provides a yes/no response option to questions whereas answers by individuals may not be clear. Since we are looking for more precision in the participants' answers, it was considered to change the Q16 questionnaire from a binary (yes/no) response to a Likert response scale (with 5 levels) and to assess its repeatability. This study was approved by the University of New South Wales Human Research Ethics Advisory Panel (HREA, approval number 1006) before recruitment commenced. Each subject provided written, informed consent before taking part in the study after the risks and benefits of study procedures had been fully explained.

Design

A group of 100 participants between 18-40 years of age, with an education level of high school

or technical college who were designed to have the same job level as dry-cleaners in Bogotá, was recruited to test and validate the questionnaire in Sydney, Australia.

Recruitment procedure was as follows: A letter was sent to the Human Resources Consultant of the University of New South Wales asking for their assistance to advertise and circulate our call for volunteers to Facilities Management staff, who generally hand the target level of education. Interested people were requested to contact the researchers directly by telephone or email in order to obtain the questionnaires. Moreover, friends of participants could also be recruited if they met the inclusion criteria.

Method

Three test questionnaires (see appendix A) and a demographic questionnaire (see appendix B) were supplied to participants. Firstly, they were asked to provide demographic information about their general health. Then they were asked to complete questionnaires 1 and 2 on the day they receive it and questionnaire 3 about one week later, and then to send all 3 questionnaires plus the demographic information back to the researcher. Instructions were designed to help the participant to understand the methodology and what they were required to do step-by-step. The first questionnaire was the modified Q16, the second was the original version and the third was the modified Q16. The modified Q16 was applied twice in order to evaluate its repeatability.

RESULTS

Characterization Sample

The group that agreed to participate in this study was composed of 60 males and 40 females. Twenty-nine percent (29%) of them were 23-27 years old, 28% were 28-32 and 24% 33-37 years old.

Demographic Information Results

One subject self reported suffering from diabetes; one from hypertension; five from cancer; two from neurological diseases such as epilepsy and 19 from anxiety.

Twenty percent (20%) of them were smokers; fifty-four percent (54%) were alcohol consumers. Thirteen percent (13%) took medication for problems such as allergies, infections and inflammation.

Questionnaire Answers Modified with Likert Scale, First Measure to Second Measure

The SPSS© statistical package (version 18.0) was used to analyse the data collected. Cronbach's Alpha was applied in order to analyse the reliability of the Q16 modified with a Likert scale (see Table 1).

table 1. **Cronbach's Alpha Results for Likert scale**

Alpha de Cronbach	Cronbach's Alpha de Chronbach Basado en ítems estándar	Nº de ítems
0,887	0,889	16

Source: Own elaboration

The alpha coefficient for the sixteen items is 0.887, suggesting that the items have a relatively high internal consistency (note that a reliability coefficient of 0.70 or higher is considered to be "acceptable" in research situations).

The paired t test was applied to check for differences between the first measure and second measure with the modified Q16. Questions number 15 (*I feel that I have less sensitivity or a complete loss of sensitivity in some parts of my arms or legs*) and 16 (*I often wake up and then have problems getting back to sleep again*) showed significant differences of ($p = 0.03$) and ($p = 0.02$) respectively (see Table 2). These results show that the Likert scale used in the Q16 modification is a repeatable and reliable questionnaire.

Comparison between binary (yes/no) answers in the original Q16 and the modified Q16 answers

The SPSS© statistical package (version 18.0) was used to analyse the data collected.

In order to learn about the relationship between the original Q16 questionnaire answers compared to the modified Q16 answers, a descriptive analysis was run with the SPSS program.

Considering the Likert scale scores: 1 (Strongly disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), 5 (Strongly agree) and the relationship with the positive (yes) or negative (no) answer, the results showed that when a person answered "Yes" , the answer scored between 3 (Neutral), 4 (Agree) and 5 (Strongly Agree). On the other hand, when they answered "No", the score tended towards 1 (Strongly disagree) or 2 (Disagree). Nonetheless, a couple of cases (n = 2) showed an inverse behaviour. We can only speculate that perhaps these two participants were distracted when they answered the questionnaires.

The tendency shown in the results suggests that the subjects may find it easier to use a Likert scale with more answer options than if they are forced to choose between one of two options, in this case "Yes" or "No".

As a result, taking these comparisons and the statistical analysis into account, it could be said that the modified version of the Q16 questionnaire provides a greater range of data to assess neurological symptoms.

TABLE 2. **Paired *t* test results**

	Paired differences					t	df	Sig. (2-tailed)
	Mean	Std. deviation	Std. error mean	95% confidence interval of the difference				
				Lower	Upper			
Pair 1 LiQ1 - LisecQ1	0.040	0.549	0.055	-0.069	0.149	0.729	99	0.468
Pair 2 LiQ2 - LicsecQ2	0.070	0.432	0.043	-0.016	0.156	1.619	99	0.109
Pair 3 LiQ3 - LicsecQ3	-0.050	0.411	0.041	-0.132	0.032	-1.216	99	0.227
Pair 4 LiQ4 - LicsecQ4	-0.040	0.567	0.057	-0.153	0.073	-0.705	99	0.482
Pair 5 LiQ5 - LicsecQ5	0.010	0.577	0.058	-0.105	0.125	0.173	99	0.863
Pair 6 LiQ6 - LicsecQ6	-0.060	0.397	0.040	-0.139	0.019	-1.510	99	0.134
Pair 7 LiQ7 - LicsecQ7	-0.030	0.540	0.054	-0.137	0.077	-0.555	99	0.580
Pair 8 LiQ8 - LicsecQ8	0.090	0.514	0.051	-0.012	0.192	1.75	99	0.083
Pair 9 LiQ9 - LicsecQ9	0.070	0.590	0.059	-0.047	0.187	1.186	99	0.239
Pair 10 LiQ10 - LicsecQ10	0.060	0.633	0.063	-0.066	0.186	0.948	99	0.345
Pair 11 LiQ11 - LisecQ11	0.040	0.511	0.051	-0.061	0.141	0.783	99	0.436
Pair 12 LiQ12 - LicsecQ12	0.020	0.402	0.040	-0.060	0.100	0.498	99	0.620
Pair 13 LiQ13 - LicsecQ13	-0.030	0.332	0.033	-0.096	0.036	-0.904	99	0.368
Pair 14 LiQ14 - LicsecQ14	-0.010	0.522	0.052	-0.114	0.094	-0.192	99	0.849
Pair 15 LiQ15 - LicsecQ15	-0.110	0.490	0.049	-0.207	-0.013	-2.244	99	0.027
Pair 16 LiQ16 - LicsecQ16	-0.160	0.677	0.068	-0.294	-0.026	-2.362	99	0.020

Source: Own elaboration

DISCUSSION

Considering the results from the modified Q16 and comparing those with the original (Lundberg, 1997), the Likert scale may be regarded as a good tool for measuring and comparing symptoms reported on a series of questions statements or issues with greater precision than is possible with a yes-no type question and greater ease of evaluation than is possible with an open- ended question (Shank, P. and Bircher, J., 2009).

Forcing responses artificially into a "yes" or "no" format only may reduce individual differences, fail to indicate the strength (or weakness) of a belief, introduce a systematic source of error, and coerce subjects into a response that they did not originally intend (Chandler and Patterson, 1976).

According to Brehm's (1966) psychological reactance theory, any perceived, threatened or loss of freedom motivationally arouses the individual to resist doing or taking what he/she originally intended. If a subject agrees with reservations but is forced to respond unequivocally with a "yes" or "no", he/she may tend to avoid attending to the task by answering in a random fashion or refusing to answer altogether.

The modified Q16 questionnaire showed an excellent internal consistency (0.887) (Nunnally, JC and Bernstein, IH, 1994). Moreover, the majority of questions showed good repeatability. Only two out of 16 questions showed a significant difference in the paired t test. Perhaps these two questions may be affected by a subject's short term behaviour, such as lack of sleep, distraction and mental fatigue, among others.

Based on the comparisons and statistical analysis, the modified version of the Q16 questionnaire could be considered as a better option to learn about neurological symptoms because the individual would not have to force the answers.

CONCLUSIONS

To use the Likert scale in the Q16 questionnaire gives more proximity to the real answer that a subject wants to give.

The modified version of the Q16 neurotoxic symptoms questionnaire gives subjects more choices to express his/her feelings, internal consistency and repeatability.

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APPENDICES A

THE UNIVERSITY OF NEW SOUTH WALES

DATE OF COMPLETION_____ ID Number_____

NEUROTOXIC SYMPTOMS QUESTIONNAIRE Q16 – NUMBER 1

Nº	Statement	*Scale*				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	I have a short memory					
2	My relatives and/or friends have told me that I am forgetful					
3	I forget activities that I consider important					
4	I generally find it hard to get the meaning of the news, programs, or fiction series that I watch on TV or listen to on the radio					
5	I have problems with concentrating					
6	I often feel irritated without any reason					
7	I often feel depressed or sad without any particular reason					
8	I have problems deciding to do activities I know I must do					
9	I feel abnormally tired					
10	Sometimes I feel an oppression of my chest					
11	I have had a sudden sensation of falling down while standing or walking					
12	I often have a painful tingling in some part of my body					
13	I have problems with buttoning or unbuttoning my clothes					
14	I feel that I have lost strength in my arms or legs					
15	I feel that I have less sensitivity or a complete loss of sensitivity in some parts of my arms or legs					
16	I often wake up and then have problems getting back to sleep again					

THE UNIVERSITY OF NEW SOUTH WALES

DATE OF COMPLETION_____ ID Number_____

NEUROTOXIC SYMPTOMS QUESTIONNAIRE Q16 –NUMBER 2

N°	Question	Scale	
		Yes	No
1	Do you have a short memory?		
2	Have your relatives and/or friends have told you that you are forgetful?		
3	Do you often forget activities that you consider important?		
4	Do you generally find it hard to get the meaning of the news, programs, or fiction series that I watch on TV or listen to on the radio?		
5	Do you have problems with concentrating?		
6	Do you often feel irritated without any reason?		
7	Do you often feel depressed or sad without any particular reason		
8	Do you have problems deciding to do activities I know you must do?		
9	Are you abnormally tired?		
10	Do you sometimes feel an oppression of your chest?		
11	Have you had a sudden sensation of falling down while standing or walking?		
12	Do you often have a painful tingling in some part of your body?		
13	Do you have problems with buttoning or unbuttoning your clothes		
14	Do you feel that I have lost strength in my arms or legs?		
15	Do you feel less sensitivity or a complete loss of sensitivity in some parts of your arms or legs?		
16	Do you often wake up and then have problems getting back to sleep again?		

THE UNIVERSITY OF NEW SOUTH WALES

DATE OF COMPLETION_____ ID Number_____

NEUROTOXIC SYMPTOMS QUESTIONNAIRE Q16 – NUMBER 3

Nº	Statement	*SCALE*				
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	I have a short memory					
2	My relatives and/or friends have told me that I am forgetful					
3	I forget activities that I consider important					
4	I generally find it hard to get the meaning of the news, programs, or fiction series that I watch on TV or listen to on the radio					
5	I have problems with concentrating					
6	I often feel irritated without any reason					
7	I often feel depressed or sad without any particular reason					
8	I have problems deciding to do activities I know I must do					
9	I feel abnormally tired					
10	Sometimes I feel an oppression of my chest					
11	I have had a sudden sensation of falling down while standing or walking					
12	I often have a painful tingling in some part of my body					
13	I have problems with buttoning or unbuttoning my clothes					
14	I feel that I have lost strength in my arms or legs					
15	I feel that I have less sensitivity or a complete loss of sensitivity in some parts of my arms or legs					
16	I often wake up and then have problems getting back to sleep again					

APPENDIX B

Demographic information

Q1: Age (years):
- ☐ 18 – 22 ☐ 23 – 27
- ☐ 28– 32 ☐ 33 – 37
- ☐ 38– 42 ☐ 38-40

Q2: Gender:
- ☐ Male
- ☐ Female

Q3: Do you suffer from Diabetes?
- ☐ No
- ☐ Yes

Q4: Do you suffer from Hypertension?
- ☐ No
- ☐ Yes

Q5: Do you suffer from cancer?
- ☐ Yes
- ☐ No

Q6: Do you suffer from any neurological disease? Please if *yes*, state the name of the disease.
- ☐ No
- ☐ Yes

Name of the disease:_____

Q7: Do you suffer of anxiety or depression?
- ☐ No
- ☐ Yes

Q8: Do you smoke? if *yes*, answer question number 9
- ☐ No
- ☐ Yes

Q9-: How many cigarettes you smoke per day?
- ☐ 0-4 ☐ 5-9
- ☐ 10-14 ☐ 15-19
- ☐ ≥ 20

Q10-: How many cigars you smoke per day?
- ☐ 0-4 ☐ 5-9
- ☐ 10-14 ☐ 15-19
- ☐ ≥ 20

Q11: Do you drink alcohol? if *yes*, answer question number 13
- ☐ No
- ☐ Yes

Q12-: How many alcoholic drinks you drink per day?
- ☐ 0-4 ☐ 5-9
- ☐ 10-14 ☐ 15-19
- ☐ ≥ 20

Q13: Do you take medication? If *yes*, answer question number 15
- ☐ No
- ☐ Yes

Q14-: What it is for?
- ☐ Infections
- ☐ Diabetes
- ☐ Hypertension
- ☐ Allergies
- ☐ AINES
- ☐ Corticoids
- ☐ Other (Specify) _____

DATE OF COMPLETION_____ID Number_____

Baseline Survey

DEMOGRAPHIC AND GENERAL HEALTH INFORMATION: Please tell us some basic information about yourself