

Validation and Application of an Instrument to Assess Attitudes and Difficulties that Forensic Science Students Present during Forensic Practice

Ileana M. Petra Micu^{1,*}, Zoraida García Castillo², Ana M. Sosa Reyes³, Mariana Fouilloux Morales⁴, Gabriela Hernández Cárdenas⁴, Patricia M. Herrera Saint Leu³

¹Department of Psychiatry and Mental Health of the Faculty of Medicine of the National Autonomous University of Mexico (UNAM). Av. Universidad 3000, Circuito Escolar s/n, Facultad de Medicina, Edificio "F", Ciudad Universitaria, C.P. 04510, Ciudad de México

²School of Forensic Science of the Faculty of Medicine of the UNAM. Av. Universidad 3000, Circuito de la Investigación Científica, Ciudad Universitaria, C.P. 04510, Ciudad de México

³School of Forensic Science of the Faculty of Medicine of the UNAM

⁴Department of Psychiatry and Mental Health of the Faculty of Medicine of the UNAM

*Corresponding author: ileanapetra@yahoo.com.mx

Abstract The School of Forensic Science of the Universidad National Autonomous of Mexico was created in 2013. Internationally, no publications were found in which the students respond to experiences posed by certain activities during their forensic practice. A Likert style instrument was developed and was validated with 269 medical students, and subject to analysis of reliability to determine the alpha de Cronbach and Varimax factor analysis, then it was applied 56 forensic science students. Results: an Alpha of .732 and it explained 47.7% of the total variance in six components: motivation, negative reactions, anxiety somatization, perceptions, aversion, and professional profile. Over 70% regarded their practice in a positive way leaving 20 to 30% with doubts and conflicts. Conclusions. While the group under study is small, the results open an important field to explore the personality that these future professionals have and if necessary to offer appropriate help to overcome these problems.

Keywords: forensic science, attitudes, reactions, students, forensic practice, dissection

Cite This Article: Ileana M. Petra Micu, Zoraida García Castillo, Ana M. Sosa Reyes, Mariana Fouilloux Morales, Gabriela Hernández Cárdenas, and Patricia M. Herrera Saint Leu, "Validation and Application of an Instrument to Assess Attitudes and Difficulties that Forensic Science Students Present during Forensic Practice." *American Journal of Educational Research*, vol. 5, no. 2 (2017): 138-143. doi: 10.12691/education-5-2-5.

1. Introduction

The Faculty of Medicine of the National Autonomous University of Mexico participated in the creation of the School of Forensic Science, whose curriculum was approved by the University Council on January 25, 2013 [1]. Since its inception, the authorities of this school have promoted research activities on the various aspects related to its implementation, including: the formative process of the students, the performance of teachers and the evaluation of the curriculum.

While forensic science was already an area in process since the nineteenth century, it was almost a hundred years ago, in a Swiss University, where the need for an Institute of forensic science that would encourage activity in this discipline was evident, in order to generate different discoveries, such as: the identification of poisons from human tissue, the relevance of some features of the bullets extracted of the body of a victim, the use of traces fingerprint to identify to the perpetrator of a crime, etc. [2].

Since then, forensic research has focused on the technical aspects of the discipline, so there are no

publications about the way in which the students of forensic science respond to experiences posed by certain activities during their training, which include their forensic practice.

The Department of Justice of United States believes that a forensic science student requires personal honesty, integrity, and scientific objectivity to conclude that the professional his career and would need to pass confidence control exams. They also mentioned that in addition, the opportunities to be placed in the workplace will increase considerably depending if they are motivated by professional development [3].

On the other side, Turner [4] considered that the formation of the forensic scientist must encourage three aspects: a) develop skills such as working with others, problem solving, creativity, discipline and social skills that promote lifelong learning, as well as continued personal growth; b) to be conscious about how to define the studies they perform according to the participation of the different actors involved; and c) knowledge of the role of science in the system of administration of Justice. Outlaw and Berry [5] added that the candidate must have good judgment to qualify the data indicating the quality of the test results.

Borman [6] mentions the advantage that the formation the forensic scientist has on the conventional chemists specializing in forensics, since the first develops the sense of ethics in forensic science.

Academic research in the forensic science field differs since the sixties, from other careers that have seriously reported results of studies on the attitude of their students present in situations that arises from the practice of dissection. Such is the case of research carried out with medical students all over the world where, through the application of different questionnaires, scales and e inventories, physical and emotional reactions have been studied during dissections and how they face this experience.

It has been observed that emotional and psychological responses towards the dissection can be both positive and negative. Among the first, that occur most frequently are motivation [7], interest in the subject [8,9,10], expectations [10], desire to study [11] and curiosity [9,11]. While the negative reactions that stand out are apprehension [12], stress [10,13,14,15], anxiety [16,17,18,19], images of one loved as being a subject of dissection, loss of taste for meat [20], sleep disorders of as insomnia and nightmares [20,21], temporary loss of appetite [20,21,22], recurrent visual images of corpses or dissection [20,21,22,23], seeing the corpse as someone alive [24], concern in seeing the corpses face [15], fear of an infection [22,23] and fear to start the dissection [10,23].

Moreover, the most frequent physical reactions reported are: nausea [10,20], vertigo, dyspnea [20], dizziness [25], tachycardia [20,23], sweating [20,25], feeling of disgust [21], as well as disgust or eyes irritation due to the smell [10,15,22,23].

As to the way in which students face the dissection experience, it was observed that they tend to: have an interest in the study, mentally [22,23,25], focusing on the task [12], depersonalizing the corpse [12,25], making jokes with friends, as well as seeking advice from peers and teachers, or discussing with friends and family their experiences [21,25,26]. It has also been observed that it helps them if they concentrate before on the study atlas or CD of human anatomy [21], as well as perceiving the body as a human being depending on their religious beliefs [26].

The object of this research is to get to know the attitudes of students, through the application of an instrument designed and validated for this purpose.

2. Methods

Due to the reactions of a group of students during the dissection of corpses [20], a group of five teachers from of medicine and forensic science schools designed a Likert type scale, with forty-six items, each with five response options: always = 4, almost always = 3, sometimes = 2, almost never = 1 and never = 0.

Since the number of students that enter each year forensic science does not exceed thirty five (which makes it difficult to validate the instrument with such a small student population), it was decided to analyze the instrument with first year medical students where at least

thousand youngsters enter, with a similar formation and anatomical practice.

2.1. Validation of the Instrument in the First Year Medical Students

Using SPSS11, the data obtained from the application of the scale was subjected to analysis of reliability, to determine its Alpha of Cronbach, and factor analysis through a Varimax rotation and extraction of the main components.

2.2. Application of the Scale in the First School Years of Forensic Science Students

A similar analysis was performed from the application of the instrument in forensic students and its alpha of Cronbach and the percentage of its total explained variance in this population was obtained.

For this study, a descriptive analysis of information was conducted to assess the areas that show greater agreement among students in relation to attitudes toward dissection.

2.3. Ethics

This research project was reviewed and approved by the Research and Ethics Commission of the educational institution where it took place.

3. Results

3.1. Validation of the Instrument Students from Medical School

The instrument was applied to 344 students of the first year of medicine that have agreed to participate in the study, of which 75 applications were eliminated for not having responded to all of the items, remaining 269 students, with an age range between 18 and 25 years old (Me = 18), of which 178 (66.2%) were women.

The factorial analysis of the 46 items that initially composed the instrument to assess the attitudes of the medical students during dissection generated a matrix formed by six components. Eight items were eliminated since they did not meet the minimum factor load required (.400), so the scale was finally formed by thirty-eight items.

These items account for 47.7% of the total variance of the instrument, and presented an Alpha of .732.

As mentioned previously, factor analysis resulted in six components (Table 1), whose names and definitions were agreed upon by the investigation team, based on the different aspects of the items.

1. *Motivation*. It refers to the interest raised in the student from the practice of dissection as part of their training.

2. *Negative reactions*. This component explores inappropriate emotional responses, associated with the prospect of death.

3. *Anxiety somatization*. Refers to unpleasant physical sensations generated by the anxiety that accompanies students during dissection.

4. *Perceptions*. It's the images that the student associates with violent situations during dissection period as well as how to mitigate those thoughts.

5. *Aversion*. It refers to the discomfort that dissection practices arise in the student, inside and outside of the classroom.

6. *Professional profile*. It includes emotional situations which the student believes are present in the expert during situations that his profession presents.

Table 1. Attitudes towards dissection: Scale dimensions

Items	COMPONENTS					
	1 Motivation	2 Negative reactions	3 Physical reactions	4 Perceptions	5 Aversion	6 Professional Profile
It seems like an attractive challenge	.780	.041	-.140	.026	-.053	-.129
I consider it useful	.751	.126	-.222	-.064	-.005	-.122
It spikes my curiosity	.700	-.042	-.129	.007	-.085	.025
I find it Interesting	.665	.044	-.056	-.057	-.110	.099
I think I have a skill for dissection	.579	-.155	.052	-.090	-.038	.051
I like assisting to the forensic practice	.573	-.150	-.109	-.094	.003	-.123
Forensic practice makes me want to live intensely each moment.	.459	.287	.162	.000	-.077	.110
I'm annoyed by the unpleasant smell	-.442	.222	.285	-.030	.295	.084
It makes me fear death	-.069	.794	.074	.005	.059	.040
It worries me that life passes so quickly	.057	.752	.102	.122	.005	.063
I'm afraid that someone I love could die.	.023	.693	.013	.107	.138	.143
I feel bad when people talk about death.	-.056	.612	.147	.211	.270	-.184
I'm afraid I'll die.	-.103	.574	.460	.047	-.070	-.005
I feel anxiety at the thought of what death means.	.055	.555	.078	.255	.009	.133
With forensic practices I've experienced recurrent images of violence.	-.157	.457	-.027	-.051	.269	.003
I feel I can't breathe.	-.061	-.013	.700	.171	.092	.028
I need to take something to feel better during dissections.	-.293	.194	.612	.020	-.302	-.070
I get tachycardia	.147	.075	.609	-.009	.076	-.007
I feel dizziness	-.190	.018	.578	.169	.316	.130
It's hard for me to overcome having to do a dissection.	-.387	.190	.561	-.049	.148	-.101
During forensic practice I sweat a lot.	-.054	.052	.530	.020	.255	.049
During forensic practice I distract myself by taking to my classmates.	-.445	.199	.517	.028	.140	.008
I feel nauseated	-.249	.038	.423	.161	.406	.163
I imagine myself being the subject involved in a violent experience.	.015	.186	-.005	.706	.160	-.187
I have images of a relative involved in a violent situation.	.037	.122	.129	.604	.067	.287
I experience recurrent images of violent situations.	.028	.217	-.020	.579	.293	-.161
I haven't been sleeping well since we started our forensic practice.	-.136	.093	.125	.545	.360	.056
I try to distract myself by listening to music	-.209	.224	.058	.537	-.150	-.052
I tell jokes during dissection	-.005	-.054	.044	.471	-.144	.091
I have developed a dislike for meat.	-.007	.127	.112	.023	.640	-.113
I have problems eating	-.075	.057	.073	.223	.599	.052
It bothers me to see a naked body	-.062	.314	.216	-.135	.538	-.080
I share my discomfort of the dissection class with my schoolmates	-.234	-.045	.187	-.008	.501	.279
It annoys me to see the face of a corpse.	-.220	.297	.390	-.161	.429	-.138
As professionals we should show indifference to human pain.	-.053	.047	.068	.109	.010	.705
Forensics should develop a cold character.	-.107	.046	-.038	.084	-.081	.665
To handle daily their daily experience with conflict or death, forensics need special psychological abilities	.051	.108	.001	-.337	.173	.496
Forensics should be able to resist odors and disturbing images.	.195	.082	.003	-.417	-.009	.457

3.2. Application of the Scale in Forensic Science

The instrument was applied to the students in the first years of their forensic science career (n = 56) and found that the items explained 58.5% of the total variance of the scale, while the alpha of Cronbach retrieved was of .791. The psychometric characteristics of the instrument are therefore similar to those observed in the medical students.

The descriptive analysis of the attitudes and reactions that of forensic science students associate with their forensic practice (Table 2) is noted next:

- 53 to 93% considered that the dissection instigates their curiosity and scientific interest, and constitutes a motivation factor during their training process.

- In general, between 66 and 98% reported that the forensic practice did not cause anguish or fear towards

death; while up to 20% pointed out that it affected them occasionally and makes them consider how important the experience of life is.

- Most students' manifest that never or almost never presented some kind of somatization disorder, eating habits or sleep disorders due to their experience during dissections.

- More than 68% refer to have never or almost never used any particular strategy to escape unpleasant feelings caused during dissections.

- Over 73% think that the forensic scientist must have specific capabilities that will enable him to cope with unpleasant aspects associated with the corpse; while less than 20% considers that professionals require being insensitive to be able to deal with the forensic practice.

- Finally, 77% reported not feeling disturbed by criminal behavior.

Table 2. First year forensic science students' attitudes towards dissection (n = 56)

Attitudes or reactions	A and AA	S	R and N
Scientific interest	92.9	7.1	0.0
Curiosity	53.6	30.4	16.1
During forensic practice I'm anxious to know what death is.	1.8	5.4	92.9
I'm afraid of dying.	1.8	8.9	89.3
I am afraid that a love one could die.	17.9	33.9	48.2
These practices with corpses motivates me to live every moment intensely.	19.6	25.0	55.4
Since we began practice with corpses, I have trouble sleeping.	0.0	0.0	100.0
Since we began practice with corpses, I've lost my appetite.	0.0	3.6	96.4
Since we make practice with corpses, I've developed aversion to meat.	0.0	1.8	98.2
Nausea.	0.0	1.8	98.2
Dizziness.	0.0	0.0	100.0
Tachycardia.	0.0	0.0	100.0
Sweating.	0.0	0.0	100.0
Lack of air.	0.0	1.8	98.2
I use whatever I can to avoid unpleasant sensations.	0.0	12.5	87.5
During practice I share my discomfort with my colleagues.	10.7	21.4	67.9
I make jokes during dissection.	1.8	0.0	98.2
To distract myself I use my cell phone during dissection	0.0	10.7	89.3
I'm always thinking of death	7.1	14.3	78.6
It bothers me when others speak of death.	0.0	1.8	98.2
I'm concerned that life will pass too quickly.	5.4	28.6	66.1
The unpleasant smells annoy me.	1.8	19.6	78.6
It bothers me to see the face of a corpse.	0.0	5.4	94.6
It bothers me to see a naked body.	0.0	1.8	98.2
The doctors must show indifference to human pain.	12.5	41.1	46.4
Forensic scientists should resist odors and disturbing images.	83.9	16.1	0.0
Forensic scientists need special psychological abilities to handle daily experiences with death.	73.2	16.1	10.7
Forensic scientists must always be calm.	19.6	51.8	28.6
I dislike criminal behavior.	3.6	19.6	76.8

A = always; AA = almost always; S = sometimes; R = rarely; N = never.

Note: The reported values refer to the percentage of students who presented these attitudes or reactions.

4. Discussion

Although it may seem obvious understanding how forensic science students think about their forensic practice with corpses, due to the fact than one could consider that they are convinced that their area basically involves working with death; unlike medical students, who in general consider dissection as a required practice to acquire knowledge of the human body, that allow them to prevent disease and promote healthy lifestyles. These are two different ways to conceptualize life and death, which can be seen in the studies referred to in the introduction to this work. But it does not mean that all forensic students react the same to these stimuli, and therefore some can present difficulties in coping with their practice.

While some authors report that medical students considered it useful because it permits them to face death for their future career as doctors, the also mention that teachers felt that the knowledge acquired is of greater relevance for their use in curing the ill [12]; others suggest that the teacher should not only base their teaching on knowledge, but provide the supports necessary to facilitate the process of adaptation of the student to work in the dissection class.

In the case of forensic science students, on the other hand, it seems that they do not require much of this type of support, because most students believe that the forensic practice is acceptable from the start and does not cause important levels of fear or anxiety. However, a low percentage of students that do present some sort of emotional reaction makes it convenient to assess the problem to provide the support if needed to prevent dropouts.

Some researchers have suggested to revise the curricula, in order to implement elective courses that provide students a series of resources that allow them to: a) to identify and discuss their reactions to death and dissection as well as b) understand the human aspect of these, to be able to handle them properly [13,14].

The beforehand studies took us to consider some differences between the students of both careers: a) while the medical students see the dissection as tool of knowledge to help patients, the forensic perceived this practice as a method to understand the circumstances associated to the death of the individual; and b) the majority of the students of this study almost never presented any somatic disorders, as studies concerning reactions in medical students where it was frequently reported the presence of nausea, dizziness, shortness of breath, as well as changes in sleep and appetite, among others [10,20,21,25]. In either case, the teacher must be aware of these possible problems in students to guide them, when required, in the proper way to handle their reactions that may be present when they practice dissection.

With regard to the way in which students seek, on their own, options to avoid the unpleasant sensations that the dissection can produce, the majority of students in forensic science say that they haven't had the need to do it, because they consider that the forensic scientist must have specific capabilities to cope with the unpleasant aspects that may arise; and on the other side medical students frequently used jokes, the depersonalization of the corpse, etc. [12,21,26].

More than seventy percent of future professional forensic scientist comment that they do not feel bothered

by criminal behavior, even after have seen the consequences of a crime during their forensic practice. This fact leads us to consider that it would be worthwhile to track this opinion throughout their career to see if their reactions increase or not in this area that will affect their ethics and professional conduct.

We believe that, while the group under study is small, the results open an important field to explore the personality that these professionals must have in forensic science and not only to consider what factors should be ideal according to what is designated in the curricula [2,3,4,5,6], but because they often do not include optimal personality traits and rarely contain other relevant aspects of attitudes that must be present.

Another phenomenon that requires attention refers to the socio-cultural aspects of forensic science student environment and, specifically in Mexico, customs associated with death are deeply-rooted, such is the case, for example, to mourn the dead (even with the corpse at home); the importance of the day of the dead festivities, where visits to the grave yards join all the family and bring food to share with their dead relatives; and another example is the preparation of sweets and toys alluding to these festivities. So to assess what is happening in other countries that have different customs may offer a better vision of the development of the students during their first years and therefore offer appropriate help when necessary.

References

- [1] Facultad de Medicina, UNAM. *Plan de estudios de la licenciatura en Ciencia Forense*. The Institution, México, 2013.
- [2] Almirall, J.R. and Furton, K.G. "Trends in forensic science education: Expansion and increased accountability", *Anal Bioanal Chem*, 376, 1156-1159, 2003.
- [3] National Institute of Justice. *Education and training in forensic science: A guide for forensic science laboratories, educational institutions, and students*, The Institution, Washington, DC, 2004. [Online] Available: <https://www.ncjrs.gov/pdffiles1/nij/203099.pdf> [Accessed May 26, 2016].
- [4] Turner, R.F. Forensic science education: A perspective. In: Davies G, editor, *Forensic science. ACS Symposium Series*, Vol. 13, American Chemical Society, Washington, DC, 1975, 17.
- [5] Outlaw, H.É. and Berry, K. Forensic Chemistry: An introduction to the profession. *J Chem Educ*, 62 (12), 1043, December 1985.
- [6] Borman, S. "Careers in forensic science", *Anal Chem*, 54 (3), 449A-450A, 1982.
- [7] Collipal, E. and Silva, H. "Study of anatomy in a cadaver and anatomical models: printing of the students", *Int J Morphol*, 29 (4), 1181-1185, 2011.
- [8] Cahill, K.C. and Eitarh, R.R. "Attitudes to anatomy dissection in an Irish medical school", *Clin Anat*, 22, 386-391, 2009.
- [9] Montemayor, B.G. "The meaning of the practice of dissection for medical students", *Int J Morphol*, 24 (4), 575-580, 2006.
- [10] Mulu, A. and Tegabu, D. "Medical students' attitudinal changes towards cadaver dissection: A longitudinal study", *Ethiop J Health Sci*, 22 (1), 51-58, 2012.
- [11] Jagua, A. and Urrego, D.Z. "Actitudes de los estudiantes colombianos de Medicina hacia la práctica de la disección en Anatomía y su relación con el puntaje en la Escala de Empatía Médica de Jefferson", *Rev Fac Med*, 59 (4): 281-307, 2011.
- [12] Druce, M. and Johnson, M.H. "Human dissection and attitudes of monodose students to death and bereavement", *Clin Anat*, 7 (1), 42-49, 1994.
- [13] Bertman, S.L. and Marks, S.C. "Humanities in medical education: Rationale and resources for the dissection laboratory", *Med Educ*, 19 (5), 374-381, 1985.

- [14] Dinsmore, C.E., Daugherty, S. and Zeitz, H.J. "Student responses to the gross anatomy laboratory in medical curriculum", *Clin Anat*, 14 (3), 231-246, 2001.
- [15] Leboulanger, N. "First cadaver dissection: Stress, preparation, and emotional experience", *EUR Ann Otorhinolaryngol Head Neck Dis*, 128, 175-183, 2011.
- [16] Arráez, I.T. and Brown, G. "Anxiety and dissection of the human body: An unsolvable relationship?", *Anat Rec B New Anat*, 279B, 16-23, 2004.
- [17] Bernhardt, V., Rothkotter, H.J. and Kasten, E. "Psychological stress in first year medical students in response to the dissection of a human corpse", *GMS Zeitschrift für Medizinische Ausbildung*, 29 (1), 2012. [Online] Available: www.ncbi.nlm.nih.gov/pmc/articles/PMC3296105/pdf/ZMA-29-12.pdf [Accessed March 4, 2016]
- [18] Casado, M.I., Castaño, G. and Arráez, L.A. "Audiovisual material as educational innovation strategy to reduce anxiety response in students of human anatomy", *Adv Health Sci Educ*, 17 (3), 431-440, Aug 2012.
- [19] Plaisant, O., Courtois, R., Toussaint, P.J., Mendelsohn G.A., John, O.P., Delmas, V. and Moxham, B.J. "Medical students' attitudes toward the anatomy dissection room in relation to personality", *Anat Sci Educ*, 4, 305-310, Nov 2011.
- [20] Sergentanis, T.N., Papadodima, S.A., Evaggelakos C.I., Mytilinaios, D.G., Goutas, N.D. and Spiliopoulou, C.A. "Students' physical and psychological reactions to forensic dissection: Are there risk factors?" *Anat Sci Educ*, 28794, 3, 2010.
- [21] Miguel, M., Porta, N., Ortiz, J.C., Martínez, A. and Götzens, V. "Human Anatomy: study of the reactions of the students of medicine to the dissection room first", *Educ Med*, 10 (2), 105-113, 2007.
- [22] Abu-Hijleh, M.F., Hamdi, N.A., Moqattash, S.T., Harris, P.F. and Heseltine, G.F.D. "Attitudes and reactions of Arab medical students to the dissecting room", *Clin Anat*, 10, 272-278, 1997.
- [23] Bataineh, Z.M., Hijazi, T.A. and Abu-Hijleh, M.F. "Attitudes and reactions of Jordanian medical students to the dissecting room", *Surg Radiol Anat*, 28, 416-421, 2006.
- [24] Quince, T.A. "Student attitudes toward cadaveric dissection at a UK medical school", *Anat Sci Educ*, 4, 200-207, 2011.
- [25] Snelling, J., Sahal, A. and Ellis, H. "Attitudes of medical and dental students to dissection", *Clin Anat*, 16, 165-172, 2003.
- [26] Lamdin, R., Weller, J. and Kerse, N. "Orientation to dissection: Assisting students through the transition", *Clin Anat*, 25, 235-240, 2012.