

# The Medical Safety of Gracie Survival Tactics for use by Law Enforcement professionals

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**Abstract:** Gracie Survival Tactics (GST) is a two-tiered defensive tactics system designed for military and law enforcement personal (MIL/LEO). Previous reviews have demonstrated the efficiency and the medical safety of the system but there remains controversy over the use of such techniques. This review will focus on the medical safety elements of the system when compared to more traditional defensive tactics systems. The safety and effectiveness of vascular neck restraints, joint and limb immobilization and directing and positioning techniques are discussed. Traditional systems that involve striking may result in damage and unpredictable response. The GST system uses techniques that are safe for MIL/LEO and the assailant and reduces the risk of injury to both. Correct training and application of the techniques will significantly reduce the risk of any medical harm coming to an assailant, which is particularly relevant for the vascular neck restraint techniques taught. Joint and limb immobilization techniques will allow a MIL/LEO to be able to control and gain compliance over a subject. Directing and positioning techniques allow for the safe application of both vascular neck restraints and joint and limb immobilization. The GST system has already been reported as being safe and this review reaffirms this and it is therefore recommended.

**Index Terms**—Gracie Survival Tactics, vascular neck restraints.

## I. INTRODUCTION

The Gracie Survival Tactics™ (GST) program is the defense tactics course uniquely offered by the Gracie Academy in California for Military (MIL) and law enforcement officers (LEO). The course offers a multi-level defensive tactics system based on original techniques of Gracie Jiu-Jitsu. It allows for real world law enforcement application of the techniques but gives extra consideration towards the lawful and humane arrest of a resistant subject and includes provision for tactical gear and body armor that may be carried or worn by the MIL/LEO.

The system has already undergone a short medical review, which suggested that GST was a significant advancement in officer safety training and that the risk of injury was low [1]. A further, more extensive review of each individual lesson has also been conducted, focusing on the safety to the officer and subject, effectiveness of technique, and ease of application [2].

The aim of this review is to compare the application of the GST tactics to more traditional methods of neutralizing attacks on officers and gaining compliance. More traditional methods typically utilize strikes to the subject, primarily using batons, but also fists, knees or elbows [3].

I am currently a GMC certified General Practitioner based in the United Kingdom having qualified in 2007. I have

been a practicing martial artist for over 20 years and also have a UK recognized Self defense qualification that focuses on Public Self Defense. I have undertaken the role of a ringside physician at many events over the past 10 years. I was given unique access to review the GST program by the Gracie Academy and my goal was to review the techniques taking into account the spontaneous nature of altercations without the MIL/LEO being able to assess the attacker's prior level of knowledge or condition.

The GST program itself classifies the techniques into 4 broad areas that have previously been documented [2]. These are direction/positioning techniques, grounding methods, vascular restraints and joint and limb immobilization. This review will primarily focus on the last 2 and compare these methods of gaining compliance against more traditional methods.

In 2015/16 there were an estimated 23,000 assaults on officers across all forces in the UK with nearly 8000 involving injury which needed to be reported to health and safety teams [4].

Differences exist in defensive tactics training but UK officers may receive a yearly refresher course that can be done over as little as 2 days and covers unarmed defense, baton and handcuff techniques. In addition, part of this time is dedicated to other areas, such as first aid training resulting in officers often receiving as little as 4 hours per year of actual combat training. Taser training requires a longer, more intensive test. The use of force will depend on

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the officer's assessment of the situation, the officer's own ability to deal with the incident and the threat posed. Wherever possible de-escalation methods of conflict management are used and tactical communications with verbal and non-verbal techniques would be used prior to primary control skills such as use of empty hand skills, joint locking and compliance techniques, use of handcuffs or batons. Secondary control techniques may then involve incapacitant sprays, or Conductive Energy Devices (CEDs or Tasers). Baton strikes can be classified by the Monadnock Baton chart and help assess the probability of injuring a person during baton strikes [5]. Although differences exist in the delivery and content of defensive tactics training, there is some overlap with the systems in the United States which often have a yearly refresher course that can be limited with regards to the numbers of hours training and content delivery.

## II. STRIKING TECHNIQUES

The use of force continuum is a standardized approach that can provide the MIL/LEO a guide to how much force may be used in a resisting subject [6]. This author's understanding is that these are graded in terms of response as such

- 1) Officer presence
- 2) Communication
- 3) Primary control – empty hand tactics, pressure points, use of handcuffs and batons
- 4) Secondary control – CS spray or Taser
- 5) Defensive and offensive techniques covering escalation in use of unarmed skills and restraints
- 6) Deadly force.

This section covers primarily empty hand tactics. Defensive or offensive techniques may be known as hard control techniques and may result in soft tissue musculoskeletal damage or bone fractures.

It has often been taught that using a strike as a distraction technique can be a way of gaining compliance with a subject before restraints can be applied. These may not be effective in real situations due to the offenders being under the influence of alcohol or drugs. Frequently more than one strike may be required and this may be seen as excessive use of force. The taught level 1 GST course is unique in that there is virtually no emphasis on such techniques at all, instead focusing on control and position techniques before using the restraint methods of vascular or limb restraints.

In addition to this, striking using any limb takes training and timing and is subject to the force that can be generated by the person delivering the strike. It would therefore be unlikely for a 135lbs female officer to be able to effectively use any form of distraction strike to gain compliance on a much larger, heavier male subject.

Hand and wrist injuries are some of the more common injuries that could be sustained during an altercation. Closed fist strikes are very likely to result in either soft tissue trauma or damage to bone. There are 5 metacarpal bones that make up the bones of the hand. These are particularly susceptible to damage. A common injury seen in professional fighters is a 'boxer's fracture' which is a fracture to the 5<sup>th</sup> metacarpal bone. Such a fracture may result in pain, reduced motion and deformity after the event, and require radiographs to assess for any angulation or displacement. Generally, stable un-displaced and non-angulated fractures will heal and can be treated with a cast or splint immobilization for periods of 3-6 weeks but more severe injuries may require surgical intervention [7]. This will result in the MIL/LEO being unable to perform their full duties or, at worse, place them at increased risk should a further altercation take place whilst they are injured.

In comparison this would not be an issue for forces utilizing the GST method as striking is not a primary mode of gaining control. Instead the concept of distance management is covered during many of the directing and positioning lessons.

The wrist may also be susceptible to damage during striking. Later, we will see that caution must be taken with some of the GST techniques in order to prevent ligament and tendon damage to the attacker. However, by using strikes, the MIL/LEO subjects his own wrist to possible blunt trauma force. Similar to hand injuries, these may occur when a strike is delivered incorrectly. Wrist fractures can prove difficult to treat and require long healing times. Wrist bones include the scaphoid bone which may be damaged either by delivering a strike with an incorrectly formed fist or by a fall onto an outstretched hand. This bone has a relatively poor blood supply and damage may result in avascular necrosis. Other bones of the wrist susceptible to damage in officers using strikes are the hamate and lunate bones. These may require surgical repair and lunate fractures in particular may result in reduced wrist range of motion and osteoarthritis, which may impact on the ability of MIL/LEO to perform their duties.

Leg, knee and foot damage may also occur in a similar fashion as hand and wrist injuries, if used by the MIL/LEO as a way of gaining compliance. There are a number of differing injuries that may occur, however these have been excluded from this article as, generally speaking, the hands would often be the mode of primary use as hand techniques take less training.

In addition, if such striking techniques are successful and no damage occurs to the officer, there is an inherent danger of causing head and facial injuries to an attacker. A direct strike to the chin may result in a knockout of the subject thought to be possibly due to transmission of the force from

the chin to the brainstem. Other 'weak' areas may also be targeted as pressure points in an attempt to produce a knockout. For example, a strike to the carotid area in the neck can cause a sudden loss of consciousness due to reflex drop in heart rate and dilation of peripheral blood vessels.

One problem with these type of techniques is that they depend upon very precise execution in order to be fully effective. User variability in the application of these techniques is common. Imprecise execution of the technique may produce an inadequate effect. By comparison, the GST techniques that are discussed later on can be replicated safely and efficiently time after time. Frequently taught Public Self Defense courses often use 'pressure points' and targeted strikes as a means to defeat and disengage from a situation. On review of the GST course and discussion with the Gracie Academy it is clear that the GST techniques are clearly superior, safer and more reliable.

Use of baton strike to a joint, e.g. elbow or knee, may result in significant joint damage requiring orthopedic surgical repair and could, ultimately, be considered a life changing injury. The use of this kind of force may require substantial justification in the future.

### III. VASCULAR NECK RESTRAINTS

There are 3 vascular neck restraints covered in the Level 1 GST program. These are the carotid restraint, triangle restraint and front headlock restraint taught at lessons 6, 16 and 20 respectively.

The initial Carotid restraint is covered early in the curriculum (Lesson 6) and few areas have caused more controversy than this technique. The technique can be applied by anyone irrespective of size and strength in order to gain control of a situation. The role of the vascular neck restraint in excited delirium has already been documented and the MIL/LEP may come across situations where they encounter emotionally disturbed individuals who may present with agitated or chaotic behavior [8]. The carotid restraint offers a valuable option that does not rely on pain compliance, blunt force trauma or multiple applications of CED devices. Entry methods are covered in the direction and positioning portions of the course. The technique taught during the course is safe and resulted in no injuries during practice. The GST instructors correctly note that the hold may not be allowed on the use of force continuum in some locations. This is primarily due to safety concerns.

The lesson teaches the vascular neck restraint whereby the carotid arteries are compressed without compression of the airway, causing cerebral ischemia and temporary brain hypoxia [9]. This results in unconsciousness typically in a matter of seconds. The subject would normally be

unconscious for no longer than 5-10 seconds but on regaining consciousness they may not be fully orientated and this may give enough time to safely secure the assailant with handcuffs and / or to call other officers to the scene. The carotid restraint is effective regardless of an assailant's size, mental status, drug use etc [2] and an officer who has been correctly taught this technique may consider its use where previously it would not have been used.

The mechanism by which this technique results in loss of consciousness is complex. Due to the virtue of their location, the carotid arteries can be compressed by direct external pressure. However, it is unlikely that external pressure will be sufficient to cause complete mechanical obstruction. Additionally, the brain has further blood supply from the vertebral arteries, which are resistant to direct pressure [10]. The actual technique, when correctly applied, may involve compression over a small neurosensory area called the carotid sinus.

Compression of the carotid sinus causes a reflex slowing of the heart rate and dilation of blood vessels, causing an abrupt fall in blood pressure. In addition, forensic studies have shown that more rapid loss of consciousness is gained if the head is rotated during the hold, as this is thought to reduce vertebral artery blood flow. Compression over the carotid area with adequate pressure will reduce blood flow to the head by up to 85% and will, in theory, result in the rapid unconsciousness of an individual without injury [11].

When teaching a technique such as the vascular neck restraint, it is always taught to avoid prolonged pressure to the neck due to the potential for cerebral damage. The duration for which a hold can or should be applied may be open to interpretation.

Controversial studies were conducted on prisoners and patients with schizophrenia in the early 1940s, after it was noted that World War II pilots could lose consciousness during a rapid ascent after bombing missions. A neck device that reduced/cut off cerebral blood flow was developed and trialed on these subjects for up to 100 seconds [12]. This resulted in a number of effects such as convulsions, cyanosis, involuntary urinary and faecal defecation and bradycardia, yet the subjects all regained consciousness within 30-40 seconds and were able to walk from the room after a further 2-3 minutes.

As with all techniques care and caution must be taken. The surprise nature of an attack may not allow for an officer to be able to assess the condition of the attacker beforehand, but using the direction and controlling techniques prior to such a move is crucial. Even within fit and healthy populations there have been case reports of strokes due to carotid artery trauma, even with apparently trivial neck injury [13]. As a result of this the MIL/LEO should exercise

caution in both the application of the technique and when teaching on any defensive tactics courses.

The GST instructors note the superiority of the vascular neck restraint to alternative moves that involve the forearm across the throat or trachea. Such moves may lead to unconsciousness but in doing so can cause severe damage to the neck structures.

Such injuries may include fractures of the larynx or hyoid bone and thus further medical intervention may be required at this stage before the assailant can be moved to a place of safety. Forensic studies have reported a number of deaths where batons or other implements have been used to compress the neck. These cases usually involved extensive hemorrhage in the neck and fractures to the hyoid or larynx and therefore should be avoided [10]. As a result, the vascular neck restraint taught in lesson 6 is safer than techniques which may restrict the breathing of the assailant.

The Triangle restraint is taught in Lesson 16 of the course and is a powerful restraint technique, as it involves the MIL/LEO using their legs against the opponent's neck, and uniquely it is done from underneath the opponent. The instructors note that, unlike vascular neck restraint taught earlier in the course, it is more unlikely to result in accidental damage due to it being more difficult to do the technique incorrectly, and thus to cause tracheal damage. However, it is a more difficult technique to apply and bulky utility belts may restrict its application. During the restraint, one of the legs compresses one side and the opponent's own shoulder compresses the other. During the lesson an arm is shown across the body as a way to maximise the effectiveness. It may be possible to compress the neck using the shoulder when the arm wraps around the leg, however this takes technical skill on the part of the attacker and the MIL/LEO. The mechanism for loss of consciousness is similar to that of the previously mentioned vascular neck restraint [14].

Finally, Lesson 20 covers the front headlock neck restraint. In contrast to the previously taught carotid and triangle restraints, which are both done on the ground, this is a vascular restraint taught standing and addresses an attacker attempting to reach for the duty belt or rushing an officer. As with the carotid restraint correct application is crucial and injury to the larynx may occur with incorrect application. This may actually occur more easily with the radial bone of the forearm being applied to the throat rather than compression of the carotid arteries.

#### IV. JOINT AND LIMB IMMOBILIZATION

Joint and limb immobilization techniques may be used to gain compliance over an assailant, for example in order to handcuff an assailant or to allow time for officers to arrive

on the scene. These techniques work on the principle of leverage.

In order to correctly execute a joint or limb immobilization technique, control must first be gained over an assailant with the use of directing and positioning techniques. These include control techniques taught from a variety of positions relative to the assailant including from the top, from the side and from beneath an assailant. These techniques have the advantage of reducing the need for use of strikes in order to gain compliance.

The americana armlock, the straight armlock, and the kimura gun retention techniques all use leverage on a joint to gain compliance. In addition, the twisting arm hand cuffing technique also uses joint based leverage to complete the previous techniques with a handcuffed assailant.

The americana armlock is shown in lesson 3. The MIL/LEO performs this technique while mounted on the opponent. Some strikes may be required in order to gain control of one arm, however, with correct directing and posing techniques this may be not required. This technique results in excessive external rotation of the shoulder as the upper arm bone (the humerus) articulates with the scapula within the glenohumeral joint. This joint is stabilized by 4 rotator cuff muscles: supraspinatus, infraspinatus, subscapularis and teres minor. Subscapularis, which lies beneath the scapula, prevents excessive external rotation. The glenohumeral joint is surrounded by a rim of cartilage called the labrum. This helps to stabilize the joint. By applying this lock excessive external rotation may induce compliance and this allows the MIL/LEO to proceed to utilization of hand cuffing techniques. However, it is important to note that there is the potential for damage to the shoulder joint to occur, including labrum tears which may require a prolonged period of rest and rehabilitation. In addition to shoulder damage, the americana armlock may stress the ulnar collateral ligament that attaches the medial side of the ulnar bone to the distal medial humerus.

In contrast to the americana armlock, Lesson 23 covers the Kimura gun retention technique. This technique, like the triangle neck restraint, is initially demonstrate with the MIL/LEO underneath the attacker and attempting to grab the weapon or sitting up to pull away. The GST instructors point out that this submission was made famous when a Japanese fighter used it to defeat their grandfather. In contrast to the previous technique, the kimura lock focuses on excessive internal rotation of the shoulder joint. This is most effectively performed at an angle of more than 70 degrees, and during the lesson the instructors talk about moving out to the side which helps establish an almost 90 degree bend in the arm. The kimura causes impingement of the rotator cuff and may result in a tear, usually of the supraspinatus tendon. This may be either a partial or full thickness tear and would result in the assailant effectively

being unable to use that arm. Typical treatment would involve a period of rest followed by rehabilitation [15].

The second part of the lesson involves applying the kimura lock from the mounted position in order to gain compliance and take the assailant into a handcuffing procedure. Again, an excessive internal rotation to the shoulder joint is applied, however due to the positional advantage of the MIL/LEO this may result in transfer of the forces to the bone structures. This may result in dislocation of the upper arm from the lower arm, or forces applied to the humerus bone may directly result in fracture of the humerus bone [16].

The straight armlock taught in lesson 7 is a submission and compliance technique common to many forms of martial art and results in hyperextension of the elbow joint (humeroulnar joint). Between the upper arm (humerus) and the lower arm bones (Radius and ulnar) is a complex capsule of connective ligamentous tissue. There is a primary ligament within the arm that prevents excessive extension – this is the ulnar collateral ligament. Primarily the straight armlock applies hyperextension and can result in strain or rupture of this ligament and continued force may result in dislocation of the lower arm bone (the ulna) from the upper arm bone (the humerus). The ‘thumb up’ position mentioned during the lesson directs maximal tension at this ligament. Incorrectly applied technique may also result in hyperextension, however, the result may be damage to alternative fibers of the same ligament. Therefore, adopting a ‘thumb up’ position increase the chances of gaining compliance more quickly, without injuring the assailant (unless compliance is not gained at which point damage may occur). Danger may exist if the assailant is able to bite the MIL/LEOs leg. This is addressed during the GST course, however, should it occur there is a real risk of skin and soft tissue infection to the MIL/LEO. This may require potent antibiotic therapy and a period of time away from work.

Dislocation of the joint may occur if the elbow is hyperextended. Dislocation may result in damage to nerves in that area, namely the median, ulnar and radial nerves [17]. Another result of sudden extension during the armlock could be a risk to the olecranon bone. Both of these injuries would require a physician assessment and may result in long-term damage.

The joint and immobilization techniques position the assailant so that the MIL/LEO is able to proceed to the twisting arm hand cuffing technique. This technique results in the swift application of handcuffs to a prone opponent. The initial turning motion utilizes internal rotation of the shoulder joint and then the wrist joint is isolated before cuffs are applied. The wrist is held in a flexed position as a temporary holding procedure.

The complexity of the wrist joint means that at this point in the move it may be susceptible to damage. Damage that may occur ranges from ligament sprains to bone avulsion depending on the amount of force applied. Involvement of the scapholunate ligament may result in a scaphoid fracture which is important, as this bone is particularly susceptible to avascular necrosis if not appropriately managed.

In reality, the use of a joint attack will usually result in compliance being gained without the need to resort to the use of excessive force and without resulting in joint damage. However, the MIL/LEO should be aware that damage resulting from using such techniques may have a longer healing process than soft tissue injuries generated by blunt force trauma and thus, use of such force must be reasonable and proportional to the threat level.

## V. SUMMARY

In conclusion, and as previously stated by other medical authors, the techniques of GST are safe and applicable. As a result of being able to use such techniques, the MIL/LEO will be more likely to remain safe and is less likely to have to use excessive force which, medically, may be detrimental to the attacker and/or the MIL/LEO. In this author’s opinion, the techniques offer a distinct advantage to any department defensive tactics program and are less likely to result in injury to either the MIL/LEO or the subject. The program allows for a hazardous, unpredictable situation to be controlled and the threat neutralized and de-escalated. There are time constraints with many defensive tactics courses and this is addressed by the GST course in the 4-hour training module option.

Although I am not privy to the exact content of current defensive tactics training, it is my opinion that the GST course offers a distinct advantage to any officer over more traditional techniques. The GST system, with its emphasis on the safety of both the MIL/LEO and assailant, and reduction of risk of injury to both, offers a clear benefit when compared to traditional control and restraint methods. I would therefore recommend Gracie Survival tactics unreservedly.

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Each department undertaking GST must be satisfied with the safety for its own use. The author cannot accept any liability for injuries undertaken in correct or incorrect application of techniques.

## REFERENCES

- [1] Hardesty, G. (n.d.). *GST Medical Review*. 1st ed. [ebook] Available at: [http://secure.gracieacademy.com/gst\\_hosting/GST\\_Medical-1.pdf](http://secure.gracieacademy.com/gst_hosting/GST_Medical-1.pdf) [Accessed 2 Dec. 2016].
- [2] Curvin, M. (2015). *GST 2nd Medical Review*. 1st ed. [ebook] Gracie Academy. Available at: <http://www.gracieacademy.com/GST1CurvinFinal.pdf> [Accessed 1 Dec. 2016].
- [3] Gracie Academy (2016). *GST*. [email].
- [4] Gov.uk, (2016). *Statistics on the number of police officers assaulted in 2015/16, England and Wales*. Available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/539200/hosb0516-assaults.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/539200/hosb0516-assaults.pdf) [Accessed 1 Dec. 2016].
- [5] NSW POSA. 2010. Monadnock Baton Chart. Available at: <http://posa.org.au/wp-content/uploads/2010/08/Monadnock-trauma-chart.pdf>. [Accessed 1 March 2017].
- [6] West Yorkshire Police. 2014. Use of Force. Available at: [https://www.westyorkshire.police.uk/sites/default/files/files/disclosure-logs/2014\\_218\\_foi2014514185\\_use\\_of\\_force\\_policy2.pdf](https://www.westyorkshire.police.uk/sites/default/files/files/disclosure-logs/2014_218_foi2014514185_use_of_force_policy2.pdf). [Accessed 1 March 2017]
- [7] Jordan, B. (1993). *Medical aspects of boxing*. 1st ed. Boca Raton u.a.: CRC Press PAGE 287
- [8] Turner, R. "Gracie Survival Tactics' Vascular Neck Restraint And Excited Delirium.". *Gracie University*. Web. 17 Dec. 2016.
- [9] Koiwai, E. (1987). Deaths Allegedly Caused by the Use of "Choke Holds" (Shime-Waza). *Journal of Forensic Sciences*, 32(2), p.11144J.
- [10] Di Maio, V. and Di Maio, D. (2001). *Forensic pathology*. Boca Raton: CRC Press.
- [11] Reay, D. and Holloway, G. (1982). Changes in carotid blood flow produced by neck compression. *The American Journal of Forensic Medicine and Pathology*, 3(3), pp.199-202.
- [12] Smith, B., Clayton, E. and Robertson, D. (2011). Experimental Arrest of Cerebral Blood Flow in Human Subjects: The Red Wing Studies Revisited. *Perspectives in Biology and Medicine*, 54(2), pp.121-131.
- [13] McCarron, M., Patterson, J. and Duncan, R. (1997). Stroke without dissection from a neck holding manoeuvre in martial arts. *British Journal of Sports Medicine*, 31(4), pp.346-347.
- [14] Mitchell, J., Roach, D., Tyberg, J., Belenkie, I. and Sheldon, R. (2011). Mechanism of loss of consciousness during vascular neck restraint. *Journal of Applied Physiology*, 112(3), pp.396-402.
- [15] Williams GR, Kelley M. Management of Rotator Cuff and Impingement Injuries in the Athlete. *Journal of Athletic Training*. 2000;35(3):300-315.
- [16] *Frank Mir Vs Antonio Antonio Rodrigo Nogueira. UFC 140*, (2011). [TV programme].
- [17] Eiff, M., Hatch, R. and Higgins, M. (2012). *Fracture management for primary care*. Philadelphia: Saunders/Elsevier.