Dear Colleagues

**A group at 1000x is tightened by allowing muscles of the supporting arm to go limp**

**The Problem:**all shooters try out techniques which will enable them to group entirely within the V-bull (TR) or X-ring (F Class).   
This article describes a simple experiment which illustrates the effect upon a group due to the removal of nervous tension from the arm that supports the rifle. Although most shooters start shooting with arm muscles under tension, many eventually decide to mentally command arm muscles to go limp. However, many do not see this as a way of reducing the size of a group.   
An experimental trial should be the basis for such an initiative. This decision by a shooter can become the starting point for a proper scientific investigation. It is necessary to control nervous tension in arm muscles, the same as any other technique to reduce the size of a group to within 1 MOA (TR) or 0.5 MOA (F Class).   
**Discussion:**in the search for techniques to enable a shooter to group entirely within 1 MOA (the V-bull or the 6-ring), experimental trials suggest that each of the following techniques need to be investigated:

* mentally removing tension and pulse felt in muscles of the supporting arm.
* adjusting tension of the sling so that it is equal on each side of the upper arm, which can prevent pulse from being felt
* regularly adjusting contact of the sling along the forearm (away from the wrist) and over the cuff of the shooting coat, so that it keeps the supporting hand at exactly the same position along the stock
* disallowing the body from moving to return to the same position after releasing each shot (note that sling adjustment with the right hand may achieve this to some extent)
* ensuring the rifle recoil is completely unimpeded by
  + avoiding the absorption of rifle movement by the forward hand against a hand stop or sling swivel
  + minimizing tension between the shooter’s face and a cheekpiece fitted to the butt
  + minimizing tension between the thumb of the loading hand and the recoiling rifle
  + ensuring uniform contact of the loading hand with the pistol grip throughout the shoot
  + anchoring the trigger finger, through even and unchanging light contact of the three largest palm muscles with the pistol grip
  + providing a very firm contact between the butt and the shooter’s shoulder.

Many of the above techniques are avoided by F Class shooters as a result of their decision to use a mechanical rest to support the rifle. Anchoring the trigger finger by ensuring even contact of palm muscles on the pistol grip is an important technique, which must be maintained uniformly throughout a shoot. These techniques are therefore important to a TR shooter’s search for means of grouping entirely within the V-bull. However, nervous tension in muscles of the supporting arm may override nearly all of these factors. Tensing these muscles may occur automatically without the shooter being aware. Many shooters consider they have the rifle dead still, except when a buffeting wind occurs. As a result, many choose to automatically tense arm muscles regardless of the wind conditions.   
Others have experimented by starting to shoot with arm muscles tensed, then allowing them to go completely limp. Some have even utilised a Scatt computer recording system to help decide which technique results in the rifle being supported really still.   
It has been found that if arm muscles are allowed to become limp, with the weight of the rifle fully supported by the sling, then the rifle appears to be dead still. When arm muscles are allowed to go completely limp, they may feel they are being locked into place by the weight of the rifle bearing down upon them. This may be further assisted by consciously adjusting the position of the shoulder, head and the front of the body, so that the total weight is balanced upon the elbow positioned under the rifle.   
**Practical:**a group by a target rifle shooter might be used as the starting point for a scientifically structured series of trials. This might confirm whether mentally telling arm muscles to go limp could be useful in helping a shooter produce a smaller group:   
Target: 10 shots by the shooter at 1000x, in which the supporting arm was consciously told to go limp, with the weight of the rifle, shoulder, arm and head balanced upon the forward elbow.   
This group does not prove anything, other than a need for a scientifically-controlled set of trial shoots. From such a trial, the shooter might be able to conclude that there is merit in shooting with the supporting arm held limp, with the inert sling doing all the work. If scientifically planned trials were undertaken, then the effects of the above factors would be controlled, so that only a selected factor was measured.   
**Conclusion:** most shooters do not undertake scientifically-controlled trials from which to arrive at a conclusion. From these four shoots, a shooter could become interested to shoot with muscles of the supporting arm held limp. However, there are many other factors which should be taken into account before arriving at a particular set of techniques, to group at 1 MOA at 1000x. An F Class shooter would also set up a list of techniques to enable him/her to group within 1 MOA at 1000x.   
  
  
  
Note: the innermost circle represents the X-ring   
Best regards   
Geoff