

# Serenity

Neuroscience Newsletter



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During the recent court trials that were so prominent in the news, the testimonies of various experts were sought regarding the mental capacity of the accused. This happened before and after sentencing.

It was very noticeable that the experts disagreed on the diagnoses and comments were made regarding mitigation and covered various aspects.

The current diagnostic system is not perfect and needs to change, as most experts now agree. The concordance of experts in the field is low and proves the point that the diagnostic criteria should change. Many years of training and working in the field of psychiatry helps to narrow this gap.

During coffee table discussions, many opinions regarding the mental status of the accused were discussed and the opinions are very wide and often reflect the stigma and ignorance still attached to mental illness.

Various professionals work with patients who are mentally ill and it is fortunate that each has a very specific specified scope of practice. Psychiatrists are doctors who have specialised in the field of psychiatry. They are able to diagnose, treat and be expert witnesses in court regarding psychiatric disorders in a medical context. Clinical psychologists are psychologists who have a defined scope of practice to diagnose and treat psychiatric disorders through psychological means

## Scopes of practice of health professionals and the treatment of mental disorders

and are also considered experts in court regarding psychiatric disorders in a psychological context. General practitioners or family physicians can diagnose and treat psychiatric disorders but would not necessarily be considered experts in the field.

The board of psychology of the Health Professions Council of South Africa has also registered other categories of psychologists who are not primarily involved in the treatment of psychiatric disorders but can assist in the management of the psychological wellbeing of clients. They too, would not be considered experts in the field of psychiatry.

When patients are thus referred primarily with a psychiatric disorder for treatment, clinical psychologists work with family practitioners to assist with psychotherapy and psychiatrists with specialist treatments.



**Dr E Allers**  
Psychiatrist  
Life Glynnview  
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**Cover image:**  
Read more about psychologist Françoise Kubierske's hobby of archery on page 11

### Request for contributions

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## Exercising a new approach to depression

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*It's time for psychiatrists to begin prescribing exercise and meditation, not just medication, to prevent depression returning, says leading US neurobiologist, Dr Rakesh Jain.*

*Glynis Horning, award-winning writer with a special interest in health and mental health, reports on the talk he recently presented at SASOP 2014 in Durban.*



**Dr Rakesh Jain, MD, MPH**  
Associate Clinical Professor, Department of Psychiatry and Behavioral Sciences, University of Texas Medical School Houston, Texas.  
Director of Psychiatric Drug Research for the R/D Clinical Research Center, Lake Jackson, Texas

Current pharmaceutical treatment options for depression are “all very good,” says Dr Rakesh Jain, clinical professor of psychiatry at Texas Tech University School of Medicine in the US. “But the sad thing – in fact, the thing that scares the living daylights out of me -- is that we don’t do well with remission rates, and have high rates of relapse from disorders,” he told a packed plenary session at this year’s SA Society of Psychiatrists Congress in Durban.

The good news is that Jain believes there is a solution in two inexpensive and scientifically proven solutions – exercise, and more controversially, meditation. “I look Indian because I am, but I didn’t come to meditation just because of that,” he says. “I came to it the hard way – because the data is so good.”

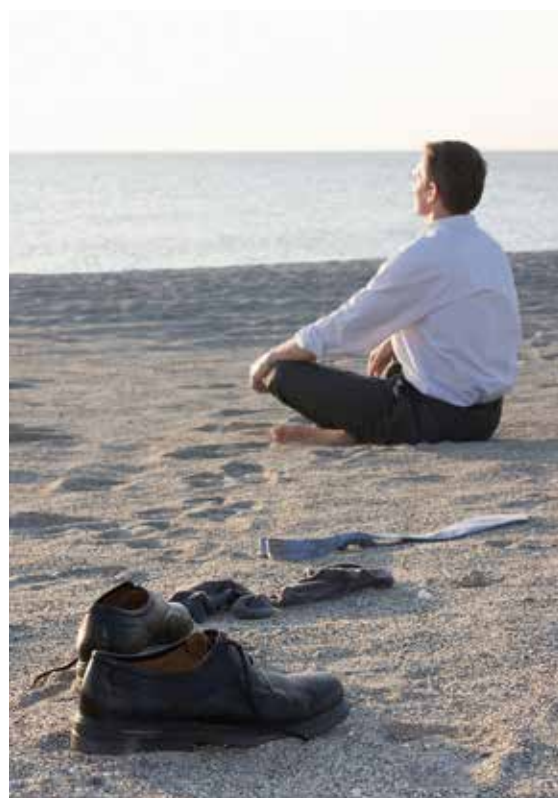
Numerous studies in recent years have shown that exercise and meditation are interventions “equally or more effective” than medication in preventing the return of depression - and he believes the time has now come for them to be prescribed along with it. It’s no small recommendation, coming from someone who is also the director of psychiatric

drug research for the R/D Clinical Research Centre at Lake Jackson, Texas.

“The effects of exercise are as profound above the neck as below,” Jain says. He cites studies in which exercise has been shown to increase the generation of new cells in the hippocampus region of the brain (which shrinks with exposure to stress and depression), modulate inflammatory cytokines (chemical messengers which have been linked with depression), improve immune functioning, and alter mood-enhancing neurotransmitters, not just dispelling negative mood, but developing positive mood.

Brain scans have shown a reduction in opioid receptor availability after exercise, so you feel less pain, and feel happy and euphoric, Jain says: “Runner’s high is a true biological intervention.”

Exercise is effective for all ages, he adds, and has been shown in studies of young and old



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*Psychiatrists should prescribe exercise and meditation to patients just as they do medication, Jain says, explaining the benefits to them and checking for compliance.*

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mice to “positively impact BDNF” - brain-derived neurotrophic factor, a protein which promotes neuron growth and produces antidepressant effects.

In a Cochrane Database meta-analysis of 25 studies comparing the effects of exercise and antidepressants, the results for exercise were “slightly better” than for antidepressants, Jain reports, “but evidence suggested that exercise probably needed to be continued in the longer-term for benefits to be maintained”.

Aerobic exercise is good, but resistance training is even better, and the most effective exercise is a combination of the two, he says.

Frequency, intensity and duration matter, and studies show that in order to benefit, it is necessary to do 20 to 30 minutes of exercise a day (at once, or in several short sessions), at least five times a week, at a moderate intensity “that makes it difficult to speak normally while doing it”.

### **Meditation as medication**

Scientific data on the benefits of meditation in treating depression are even better than for exercise, Jain says. “If you think meditation is something done by removing your clothes and sitting in the lotus position, you need to change that. It’s you and me, doing it in suits.”

Of the different forms of meditation, from transcendental to compassion, loving-kindness and heart rhythm meditation, the best data are for mindfulness meditation.

He defines mindfulness as “paying attention in a particular way: on purpose, in the present moment, and non-judgmentally,” in the words of Dr Jon Kabat-Zinn of the University of Massachusetts Medical Centre.

Numerous clinical studies in the past few years have shown that among other benefits, after just eight weeks of meditating for an hour a day, the amygdala (a part of the brain which becomes over-active in depressed patients) and the hippocampus change volume, he says. Inflammation is also reduced.

The best results have been from a combination of meditation with cognitive behavioural therapy (CBT) – a “promising new therapy” known as mindfulness-based cognitive therapy (MBCT), Jain explains.



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*The effects of exercise are as profound above the neck as below. Brain scans have shown a reduction in opioid receptor availability after exercise, so you feel less pain, and feel happy and euphoric*

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It has been shown to work for patients with anxiety, depression, panic disorder, even binge-eating and in one case, schizophrenia. And as with exercise, the beneficial effects continue for hours afterwards.

He advocates two hours of meditation a week and daily homework using CDs. “A large study has shown that MBCT has the same power to prevent relapse as a pharmaceutical intervention.”

Psychiatrists should prescribe exercise and meditation to patients just as they do medication, Jain says, explaining the benefits to them and checking for compliance. To help with this they should ask patients to keep written logs, and encourage them to use smartphone apps and CDs.

“Psychiatrists say they are too busy to talk patients through meditation, but they can refer them to online training, which has been shown to be effective,” he says.

“Meditation is not just a ‘feel good’ intervention, practice using a variety of different resources. it’s supported by strong neurobiological findings. Meditation is a powerful clinical intervention And it’s easy to incorporate into a busy clinical leading to better outcomes.”

## How to motivate patients to exercise for depression

Analysis has shown dropout rates for exercise treatment are similar to those found in psycho-therapeutic and drug interventions, says Dr Rakesh Jain.

- Don’t simply tell your patients to exercise and to see you in six weeks.
- Educate them about the neurobiological benefits.
- Ask them to begin with just five minutes three times a day.
- Suggest they start by exercising in water, with a cycle or by walking.
- Encourage them to aim for at least 30 minutes of moderate exercise (such as brisk walking) a day, at least five days a week.
- Monitor them: follow up every couple of weeks
- Ask them to log their exercise: provide a simple form where they fill in date, activity, duration, and indicate their mood before and after on a scale from 1 (not depressed) to 10 (very depressed).
- Ask them to write down their exercise goals to help entrench these.
- Suggest they use cellphone apps such as MyFitnessPal (which is free)
- Expect pushback: patients will often ask if you can’t give them a pill, rather than ask them to exercise.

## How to motivate patients to meditate to treat depression

- Begin a dialogue with them about meditation.
- Educate them about the neurobiological benefits.
- Provide handouts on these benefits.
- Begin your own meditation practice or refer them to clinicians who specialise in meditation.
- Provide them with a list of resources such as the book Mindfulness-Based Cognitive Therapy for Depression by Zindel Segal, Mark Williams and John Teasdale (available through Kalahari.com), which includes audio downloads of guided meditations.
- Encourage them to use one of the many meditation apps available free online.

**N**ature or nurture – still remains one of the most exciting areas of study in Translational Psychiatry. The last two to three decades have seen an unprecedented increase in the study of epigenetic modulation of human behaviour, personality and psychopathology. This has defined this area of research within the paradigm of systemic thinking, thus putting the focus on relational influences when it comes to nature and nurture. As the body of knowledge grew and the understanding of epigenetics increased, the argument for or against nature or nurture has fallen into disfavour. It became clear that neither genes nor the environment act in isolation to influence complex behaviours or increase susceptibility to psychopathology. Thus it is rather the complex range of interactions between genes and environment that mediates the formation of either psychopathology or mental health.

During the past 10 years research has shown some interesting relationships between the environment and psychiatric disorders.

Research has shown a possible link between the development of psychopathology and environmental exposure, which in turn mediates the association between the genotype and the pathology, and expressing itself in the resultant phenotype. Findings from molecular genetic studies are consistent with findings from the behavioural genetic literature in suggesting that the relationships between genes and the environment as well as personality and behavioural characteristics can bring about an interplay of influences in the development of psychopathology (psychiatric disorders). As clinicians we should endeavour to identify genetic risk and its exposure to environmental risk as causal in relation to psychiatric disorders.

Let us turn our attention now to some of those environmental risk factors that have been identified in the relational mediation of psychiatric disorders.

### **Childhood maltreatment and exposure to violence**

For many years the maltreatment of children, especially physical abuse, has been identified as a possible risk for the development of psychopathology – in particular antisocial behaviour in boys. Adding complexity to the picture a number of studies have also indicated that exposure to maltreatment and violence can lead to resilience and better functioning than would be expected.

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## **Environmental influences in relation to psychiatric disorders: Basic Neuroscience Research**

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Sitting above the DNA sequence is another layer of information referred to as the ‘epigenome’ that regulates several gene functions, including when and where genes are actively expressed. Epigenetics refers to the reversible regulation of various gene functions, occurring independently of the DNA sequence. This is mediated primarily through biochemical changes in DNA methylation and chromatin structure. Epigenetic processes are often tissue-specific, developmentally regulated and highly dynamic. Epigenetic processes are influenced by factors in the environment such as nutrition, chemical factors, physical factors, and psychosocial factors. Epigenetics therefore represent a potential link between genes and the environment and may play an important role in human health and disease, with increasing evidence for their involvement across the spectrum of chronic illnesses, including physical, physiological, and mental disorders.

Changes in DNA methylation following early life stress have been associated with long-term changes in gene expression and behaviour and there is evidence that they contribute to both psychiatric disorders and physiological disturbances later in life. A considerable body of evidence has become available through research that early life experiences of violence and maltreatment not only mediate epigenetically towards psychiatric disorders but also to physical illnesses. These research results have also indicated that inter-relational connections exist between these possible psychiatric disorders and physical illnesses. Epigenetic changes have been noted following exposure to severe stressors that could result in physical illness, such as violence in relation to two biological systems involved in the stress response, namely the hypothalamic-pituitary-adrenocortical axis (HPA) and the inflammatory system. The emerging literature indicates a role for gene expression in mediating the effects of stress exposure on the immune system and the sympathetic nervous system.



**Gerhard Grundling**  
Clinical Psychologist  
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***Research evidence shows that childhood violence and maltreatment is associated with risk for many different kinds of psychiatric disorders, comorbidity, unfavourable course of illness and poor treatment response.***

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It needs to be understood that mental health is a very important indicator of the health status of the brain. Evidence is mounting that mental disorders involve physiological changes, such as elevated inflammation. Associations between childhood maltreatment and violence and adult mental disorders have been reported in relation to exposure to domestic violence, physical abuse, sexual abuse, emotional abuse, and neglect. Research has also challenged the view that bullying is harmless, by showing that it increases the risk of developing psychiatric problems.

Research evidence shows that childhood violence and maltreatment is associated with risk for:

- many different kinds of psychiatric disorders,
- comorbidity,
- unfavourable course of illness, and
- poor treatment response.

Childhood maltreatment and violence is significantly associated with mood, anxiety, behaviour, and substance-use disorders, as well as with an individual having more than one of these disorders simultaneously. It is furthermore linked to schizophrenia, psychosis, and psychotic-like symptoms. Childhood maltreatment predicts an unfavourable course of depression, as defined by both recurrence and persistence. Anxiety disorders and substance-

dependence disorders have been shown to present with a high rate of recurrence. Although violence and maltreatment in childhood is a potent risk factor for developing psychiatric disorders, there are marked individual differences in response and many children who are victimized remain healthy. Further research needs to be done to identify epigenetic variants that mediate towards resilience.

Research indicates that the gene – environment interaction seems to be influenced by the presence of low levels of the MAOA enzyme, often leading to the development of conduct disorder, antisocial personality, and violent criminality in adulthood compared to maltreated children with a high-activity MAOA genotype. The earlier the maltreatment is experienced the greater the impact on the child. It has also been indicated that social support can protect even genetically vulnerable children from the negative influences of maltreatment. Thus these environmental influences mediate to opposites, namely psychopathology and resilience.

Neuro-psychological tests are sensitive indicators of integrity of the brain and its mental functions. An aggregate of an individual's neuropsychological abilities (the IQ) is a proven reliable predictor of life-long health, morbidity, extent of frailty during late-life, and early mortality. In essence IQ can be seen as a protective factor to the development of psychiatric disorders. The IQ remains the best predictor of life success outcomes which in turn enhances mid-life health, education, occupational attainment, and work performance. Childhood chronic stress (maltreatment/violence included) disrupts the homeostasis of stress-biology systems (including inflammation and HPA-axis hormones). This in turn disrupts normal development of brain structures which produces observable deficits in stress-exposed individuals' tested learning, memory, and attention capacities.

Studies comparing maltreated children versus non-maltreated children have detected deficits in maltreated children's IQ, as well as when tested for memory, executive functions, attention, and concentration. This remained such into adulthood with an average deficit of 10 IQ points. Chronicity of maltreatment has a greater impact on deficits in executive functioning compared to children being situationally maltreated. There is a tendency for the deficits to worsen over the course of life. Researchers are suggesting that treatments that are able to re-establish homeostasis in the stress hormone and inflammatory systems should be developed and these may enhance mental abilities.



Through some studies on childhood maltreatment and violence it has been tentatively identified that these environmental influences (maltreatment) could mediate epigenetic expression on telomere erosion. Telomeres are the repetitive TTAGGG sequences which cap and protect the ends of chromosomes. They play a major role in regulating cellular replication, and shorten progressively with each cell division in replicating human tissues. Cells enter a state of replicative arrest called senescence when telomeres reach a critically short length. Shorter telomere length and increased erosion rate are both associated with higher risk of morbidity and mortality. New studies are indicating that shorten (eroded) telomeres in conjunction with a broad range of risk factors may indicate morbidity towards inter alia mood disorders, schizophrenia and psychosocial stress.



One of the studies during the past two years found evidence that children who experienced two or more kinds of violence exposures showed significantly more telomere erosion between age 5 (baseline) and age 10 (follow-up measurements). This finding provided the first evidence that stress-related accelerated telomere erosion between two repeated measures can be observed already at a young age while children are experiencing stress, and well before they develop poor health as adults. As mentioned these are early results and caution must be shown as the latest studies indicate the shortening of telomeres is far more complex than previously identified. Furthermore, evidence of possible telomere lengthening being epigenetically mediated has been published indicating the complex nature of variants of epigenetic expression.

### Major psychotic disorders

Major psychotic disorders include bipolar mood disorder and schizophrenia. The mechanism through which environmental factors act upon molecular and cellular processes in the human brain and ultimately give rise to psychosis-related phenotypes and psychopathology, remains not fully understood. Even so, it is well recognised that several studies have highlighted a crucial role for environmental factors in the aetiology of major psychotic disorders and a number of environmental exposures have consistently been associated with both the expression of schizophrenia and bipolar disorder.

Evidence suggests that older fathers, especially older than 35 years, do put their children at greater risk for the development of schizophrenia and other

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***Children who are bullied at ages 8 to 10 years have about a 2-fold risk of psychotic symptoms later in life with an even more elevated risk when victimization is chronic or severe.***

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psychotic disorders. Various mediating factors have been indicated leading to epigenetic changes such as sperm changes due to multiple cell divisions. It is also possible that accumulated exposure to various environmental toxins over the life course could result in germ line alterations in older men.

Nutritional factors can also increase the risk of the development of schizophrenia. If mothers suffer malnutrition very early during pregnancy this could mediate epigenetic changes. Several nutritional factors such as protein malnutrition, deficiencies of vitamin A or D, essential fatty acids, and folate have been proposed to be responsible for the increased risk of schizophrenia in children. Malnutrition also increases stress levels that contribute to a greater risk for psychopathology. There is thus accumulating evidence of the critical role for nutritional factors, especially folate levels, in linking epigenetic variation, early development, and the risk of major psychotic disorders.

Evidence exists of an association between the rearing environment, childhood stress, and an increased risk of psychosis later in life. Children adopted from a family with a positive history for psychosis who had been brought up in a dysfunctional adoptive family environment have an increased risk of developing a psychotic

spectrum disorder. Conversely, a positive rearing environment may decrease the risk of a psychotic disorder later in life. It has been shown that high-risk children with positive parental relationships have a lower risk for developing psychotic disorders. Children who are bullied at ages 8 to 10 years have about a 2-fold risk of psychotic symptoms later in life with an even more elevated risk when victimization is chronic or severe. Animal studies have clearly shown that the psychosocial environment and stress which promotes epigenetic changes may mediate an increased risk to the development of psychotic disorders.

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***Over recent years, evidence from epidemiological studies and meta-analyses has established cannabis as a clear risk factor for later psychotic symptoms or psychotic disorders***

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Research has identified that chronic psychosocial stress, especially defeat stress, alters gene expression and BDNF (Brain Derived Neurotrophic Factor) levels, via a range of epigenetic mechanisms including histone tail modifications and DNA methylation. Altered BDNF transcription has been linked with psychosis, while epigenetic moderation of BDNF transcription has also been shown to be involved in neuroplasticity and experience-dependent learning and memory. Although a direct link between childhood trauma, epigenetic modifications, and psychosis is not established in humans, indirect evidence suggests a potentially major role for epigenetic mechanisms in mediating this environmental influence on psychosis.

Over recent years, evidence from epidemiological studies and meta-analyses has established cannabis as a clear risk factor for later psychotic symptoms or psychotic disorders. The age (or developmental stage) at which individuals start using cannabis influences this association. Gene-environment interactions are implicated in the association between cannabis and psychosis, thus persons with gene promoting factors will be at greater risk for the development of psychosis. The abuse of psychostimulant drugs shares a number of neurobiological changes such as long-term alterations of mesolimbic and prefrontal dopaminergic neurotransmission while also

expressing behavioural similarities to positive symptoms and long lasting cognitive deficits such as seen in schizophrenia. Evidence from human studies also highlights the occurrence of long-lasting changes in gene expression in subjects exposed to psychostimulants. Exposures to cannabis, cocaine, and phencyclidine in humans share many transcriptional changes in the brain. Hierarchical clustering of these transcripts indicated that genes from the calmodulin signaling cluster were predominantly affected in the brains of abusers, a finding that may be of particular importance given that enhanced dopamine release due to sensitization depends on calmodulin signaling. Evidence, at least from animal studies, has started to accumulate indicating that long lasting changes of intracerebral gene transcription, leads to the crucial, mediating role of the epigenetic changes with the abuse of these drugs resulting in serious psychopathology.

#### **Postscript**

The field of Translational Psychiatry is relatively new and presents a view on the future pertaining to the understanding of interrelational environmental and genetic factors that modulate psychopathology and mental health. With better understanding of these processes, clinicians will be able to refine and develop state of the art treatments, from various disciplines dealing with mental health.

The format and content of this article has been motivated to a great extent by the third Klaus-Grawe Think Tank meeting, which took place from June 23 to 27, 2012, in Zuoz, Switzerland, hosted by the Klaus-Grawe Foundation. The Foundation's purpose is to promote excellent, interdisciplinary and innovative research in clinical psychology and psychotherapy and their connected disciplines (neurosciences) in order to improve prevention and treatment of psychological problems and disorders.

**References available on request.**

# Traditional archery using longbows or recurve bows **Travel/Hobby** **Corner**

By **Francoise Kubierske**, Counselling Psychologist, Atlasville, Boksburg



From left: Francoise Kubierske, Recurve shot at ABO Nationals, group of friends shooting longbows, beautiful longbows by Timberpoint's Jaco Wessels and a 2D target during a competition.

## **What does it involve?**

Using a traditional bow and arrows to shoot at targets. There are various formats, including indoor or outdoor shooting, 2d or 3d targets, and at various distances.

## **What do you enjoy about it, what rewards do you find in it?**

I love that our whole family participates. It is a way for us to spend quality time together and share experiences. Many competitions are in neighbouring provinces (generally on game farms), so we get to go away for weekends and be with friends and family. People who are interested in traditional archery come from all walks of life. When we are out in the bush shooting, it doesn't matter what job you do. There is a sense of camaraderie: everyone is open to sharing tips and experiences. It is also magnificent to spend so much time in nature. We are outdoors so often. Being in the bush, often in between wild animals, allows you to reconnect with nature and find parts of your ancient spiritual self. In traditional archery, there is a meditative element to developing the skill. It is so important to be in the moment. As soon as you start focusing on the points you have accumulated or how you are faring against a competitor, you lose your focus. Similar to other sports, you have to get into the zone or be in the flow. When that happens, the shot comes together.

## **What advice would you give to others who are interested in taking up this hobby or interest? Where would they start?**

There are not many places where one can learn to shoot a traditional bow. Many archers struggle along and teach themselves for the most part and this can be very discouraging. Most of the archery shops specialise in compound bows, which is far more popular. It can be very expensive starting out with incorrect equipment. Bowyers like Cupido's Pierre de Wet in Marble Hall, can supply you with a good bow and suitable arrows for your style of shooting. He can also give you some pointers and get you started. There are also many instructional books and videos available. The most active traditional club at the moment is Elgro Traditional Archers in Potchefstroom.

## **Do you do this competitively?**

Yes. Most of the get-togethers involve some sort of competition. There are many different formats for competition shooting. I mainly take

part in ABO and SANIFAA shoots. Both of these organisations have monthly competitions, and have national and international affiliations to competitions.

I have participated at national and international level. There are not many traditional female archers and I have the dubious honour of finishing first and last! I have won at national level in different competitions and in the World Championships I finished 7th of 12 participants in my class. The World Championships were amazing. Over three days I was privileged to meet some of the world's best archers and to learn from them. They are so skilled and I aspire to shoot at that level.

Some of the most fun we have is when the traditional community hosts its own competitions. These do not qualify for any provincial or national recognition, and are friendly get-togethers. The targets are generally more challenging, and include moving targets or 'hostage situations'.

## **Other interesting information about your hobby?**

Archery was the most popular sport at the Olympics. The bows used in the Olympics were recurves, although the allowed additions (e.g. stabilisers) to the equipment put these bows in a different class and make them far more accurate.

Another form of archery is mounted archery. Here the archer is riding on horseback, and shooting targets in quick succession. This brings a new challenge, as you have to time your aim with the motion of the horse. It naturally means that in addition to shooting a traditional bow, you also have to be a skilled rider.

Archery also has a creative element if you are interested in making the equipment. It is possible to make your own bow, although that takes specialised skills. Pierre de Wet has been creating a horn bow over the last few years, that is made with gemsbok horn, sinew and held together with glue made from rabbit skin. Many archers do not get involved to that level, but like making their own arrows. You can buy wooden shafts, cut your own fletches to your liking and decorate your arrows.

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**Reference:** 1. Chetty S, Baalbergen E, Bhigjee AI, Kamerman P, Ouma J, Raath R, *et al.* Clinical practice guidelines for management of neuropathic pain: expert panel recommendations for South Africa. *S Afr Med J* 2012; **102**(5):312-325.

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