This is a test.

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(Video plays)

SPEAKER:
What do you think of when reaching far beyond your toes, the beauty of yoga is that it is much more than a sequence.

SPEAKER:
you think of yoga? Poses on a mat? A perfect alignment? Thank you so much for joining us.

SPEAKER:
Yoga is also activism. Yoga is about a quiet internal journey and a growing powerful outward voice. Yoga is action, curiosity, empathy, join us as we celebrate yoga. The diversity of the millions who practice it, and the power it gives us all!

Because we are all for yoga. And yoga is all for us.

DR SAT BIR SINGH KHALSA:
Well, welcome everyone to this webinar. With the yoga alliance on the topic of exploring scientific research on yoga an alternative we would be grateful if you can enter your information on that poll.

We want to make note this webinar is for CE credits and the use of yoga is recommended alongside traditional medical conditions. However, if someone you know needs help we suggest they seek it from medical professionals. My name is Sat Bir Singh Khalsa, I am an associate professor of medicine at Harvard Medical School and I been conducting research about yoga for over 20 years.

I also serve with the international Journal of yoga therapy as editor-in-chief and the main coordinator for our annual symposium on yogurt research.

We are joined today by two guests, Doctor Shirley Tellis from India, she has an MB BS degree from conventional medicine and a master and PhD degrees in neurophysiology which were both on research on the effects of yoga practice.

She received a Fulbright Fellowship in 1998, and 2001, a Templeton foundation award for creative ideas and neurobiology in 2001. In 2007, she received in English and -- Indian counsel of medicine award for studying the meditative effects of (unknown term) and fMRI. She has been the director of a research foundation in India since 2007. She has over 200 research papers on yoga cited and has edited over eight books on yoga. She's also an enthusiastic practitioner of yoga.

Our second guest, Saraswathi Vasudevan is an internationally, for 20 years she was a

consultant, trainer, and head of department in Brunei. She has conducted workshops across the world on the emerging field of yoga therapy. She found (unknown name) with a goal of making healing wisdom of yoga more accessible to everyone.

She has a capacity to develop deeply nurturing connections with her students. As both a representative for India on the yoga alliance board, her perceptions to change yoga to the world and bring its true essence and meaning for all. The format of the webinar today is that I will make some introductory comments, taking about 10 minutes to set the playing field in terms of what we know about pranayama in general.

And then Shirley Telles who is probably the world's foremost expert on research on alternative nostril breathing will give a 20 minute presentation summarizing the research on that particular practice.

Finally Saraswathi will talk about the practical applications as a teacher and take us through a practical technique itself. My goal for the first presentation is really to set the stage, I am calling this an introduction to the science of yoga breathing, pranayama meaning breathing techniques within yoga practices.

These practices go way back, in fact, they are actually they are (unknown term) of yoga practices, the mind is also calmed by regulating the breath. Particularly attending to exhalation in the natural stilling of breath that comes from such practice.

So, traditional yoga has a long tradition of incorporating breathing techniques, pranayama, in its practices. That is reflected in current practice of yoga, in fact, there are many people who are practicing perhaps nothing but pranayama, which is an important part of modern yoga practice.

That is evident just from a tour of these book covers, all specifically on the topic of pranayama practices and its effects. Even going further to not only the effects but potentially even the therapeutic effects of pranayama practices in dealing with medical and psychological conditions.

Now there is a wide variety of different types of breathing techniques, these also go back to many of the ancient texts. The most common one is the long slow deep breathing technique. This comes by many different names. It is also altered in terms of the relationship of the ratio of inhale to exhale, a common one being a 1 to 2 ratio.

And then we have the topic of today's session which is specific nostril breathing, this comes in two forms. Alternate nostril breathing, alternating between nostrils. And you one nostril breathing. There's also segmented Lion's breath, (unknown term) and slow breathing with sound like humming and OM chanting.

The physiology of these breathing practices have gone through a fairly large number of research in the past decade. We summarizes in our medical textbook on research on the physio- physiology of yoga, "the principle and practice of yoga and healthcare". Shirley and I both serve as editors. There've also been a number of reviews for specific pranayama practices themselves. This one was published in 2017.

The quote here is "pranayama is known since ancient times to relieve stress and stabilize

autonomic functions of the body. It is easy to learn, practice, and follow in our daily life". An important point here, "different types of pranayama techniques were shown to produce different effects". Not just as their wide variety upon a on the practices but there's a wide variety of different effects of these practices and quite a bit of degree of variability from lineage, transition to transition, and how this practice is applied.

Another review by our colleagues in India did a narrative review of the scientific evidence on the effects of yoga breathing. Left unit nostril breathing and right unit nostril breathing. This paper even more recently, how breath control can change your life.

So, these reviews are really rude alluding to the benefits and effects of these breathing practices. One of the effects of continued regular practice, particularly of slow breathing is that you can actually change your respiratory system. As you practice long and slow deep breathing. Over a long period of time, you start to slow your spontaneous breathing rate down.

The solid line represents after the training technique, you could see how much longer the breath is taking. They concluded that yogurt respiration training induced long-lasting modifications of the ventilatory pattern. With a modern title volume increase.

Another effective breathing techniques is the immediate impact on the autonomic nervous system which is involved in regulation of the cardiovascular system. Particularly, heart rate. One of the very important phenomenon that we need to be familiar with his heart rate variability. This is an EKG of a heart rate. As you can see, during inhalation the heart rate is faster than it is during the exhalation.

This has been called respiratory sinus arrhythmia, has a direct impact on breathing of heart rate. This is one of the major influences on what we call heart rate variability, a term that Doctor Telles will be alluding to in her presentation. As you can see on the left, normal EKG with a stable heart rate that is reflected in this low heart rate variability here from this rather fast breathing pattern. In the bottom panel. As you engage in deep breathing, you are breathing much more slowly and deeply.

As a consequence, what we see is more variability in the heart rate, you can see that in the measure of heart rate variability. Actually what we know from recent research, increased heart rate variability is very good for cardiovascular health. So, this is an important measure. Another thing we can do this kind of analysis is actually determine the degree of the autonomic nervous system, how much your autonomic nervous system is leaning towards sympathetic activation side or towards rest and digest parasympathetic side.

In this study, what you can see is those that practice slow abdominal breathing had an immediate drop in systolic blood pressure and it's now being used as one of the techniques to treat hypertension. Slow breathing also has an immediate effect on stress. In this randomized controlled trial, the experimental group that was during slow breathing prior to a stressful challenge, had less of an increase in stress than those that did not practice slow breathing technique.

Similar research has shown, actually positive effects on pain regulation that slow breathing can reduce the experience of pain and certain conditions. Recent research has become very

exciting, we are starting to see evidence that breathing pattern is actually reflected in the central nervous system. So, what you can see here is the black line is the breathing pattern and the redline is actually the activity of neurons in the brain.

So, here's the hippocampus, gray matter that is synchronized to the breathing pattern. Here in the caudal medial frontal cortex, you can see synchronization again between the breath and neurons in the brain. Suggesting that not only can breathing affect and autonomic nervous system, it can affect the central nervous system as well.

Host of different types of effects have been observed with the effects of pranayama. Many of the studies mostly done in slow breathing practices, so, increases in pulmonary function. Respiratory efficiency, heart rate variability, changes in the chemo reflex characteristics, reduction in oxygen consumption, reduction in oxidative stress, regulation of cyclist physiological arousal, regulation of blood pressure and pain pressure. So, when we turn to alternative nostril breathing this as well is an ancient technique. Sitting in the (unknown term) posture, you should fill in air through the left nostril keeping it combined according to one's ability, expelled slowly through the right nostril.

Then drawing air through the right nostril, thus through one where it was expelled and having restrained it there till possible, it should be exhaled to the other slowly and not forcibly. So, where the things you can see here, not only alternate nostril breathing but also fairly slow breathing pattern. One of the things we have to appreciate in the science here, we have a nasal cycling, this is a cycle in the autonomic nervous system that opens one nostril for a period of time, then that nostril shuts down. The other nostril will then open up.

You could see that pattern in both of these examples here, alternating between left and right nostril. I'd any one point in time, one nostril tends to be dominant. We do not notice this because the overall resistance pretty much stays the same.

This is something that is well known now, it has been studied very well, it is a rhythm in the autonomic nervous system. So, there are two things here, one is that there is an ultra radiant rhythm, a rhythm that is shorter than a day long. And also this (unknown term). These two characteristics need to be considered when talking about alternative nostril breathing.

This idea of ultra radiant riff (unknown term) latter reality revolve around the signs of alternative nostril breathing. Left right nostril challenges has visit bilaterally. One of the ones held most is general (unknown term) with right nostril breathing and parasympathetic (unknown term) with left nostril breathing.

This is reflected in one of the most recent papers published in a very prestigious Journal, one of the nature journals, scientific reports, they concluded that airflow "through the left and right nostrils is it to be entrained by an endogenous nasal cycling paste by both poles of the hypothalamus. Yoga practices suggest and scientific evidence demonstrates that not right nostril breathing is involved with relatively higher sympathetic activity while left nostril breathing is associated with a relatively more parasympathetic activity." This of course is really consistent with a lot of the early text and yoga scriptures talking about this difference in activation.

They also concluded in this study, there were direct effects on EEG activity depending on

whether you were breathing forcibly through the dominant nostril or the nondominant nostril. So, this is very exciting research, it really gives us this idea that there is something to this idea of bilateral to breathing. I went in with a caution, one of the things about alternative nostril breathing is a slow breathing pattern.

So, actually when we compare deep breathing was simple deeper than through both nostrils with alternative nostril breathing we can see very similar changes in heart rate and heart rate variability.

So, as a consequence, it's important in any kind of research where you are studying alternative nostril breathing to try to determine what effect is the slow breathing aspect of alternate nostril breathing contributing to the effect you are seeing and how much is due to the actual alternation itself. So, this is an interesting scientific question that needs to be addressed when we look at the research in this area.

So, I just want to finish withdrawing your attention to yoga alliance webpage. We have pages on the scientific research on yoga. There are specific yoga videos that are over three dozen research webinars, similar to the one we are conducting today. There are also collection of reprint citations. I will draw your attention to the category here of physical health and performance. We put many of the citations that are relevant to the psychophysiology of yoga practices, specifically also including breathing techniques.

So, I will stop right there. I will have Doctor Telles open up her slides and give us a presentation on her work. As a way of introduction, she's published more research on alternate nostril breathing than anyone else in the planet. This is not a hyperbole, she really is an expert.

DR SHIRLEY TELLES:
Namaste and greetings. That is very kind introduction thank you, I will be speaking in the next few minutes on our research on alternate nostril yoga breathing. Before I get to yoga breathing, I would like to speak about the nasal cycling which has already been discussed. So, in the next slide...

In the next slide is a picture of the nasal cycling, you can see that here. This shows that the airflow alternates between the left nostril and right nostril with the frequency of 4 to 8 hours. So, it changes like that. There are very brief intervals in between, where we may breathe equally through both nostrils. The question that arises what is the importance of this ultra radiant rhythm? If the air flows in through the right nostril or left nostril, so what?

After all a go through the common passage of the pharynx and trachea, so, what is so special? This was given by a yoga text, very nicely specified here, this text is very special, the origin is lost in antiquity.

(unknown name), a Tantric yoga text which says something very special and unique, all of us irrespective of our biological gender have a nice balance of masculine and feminine energies. A nice balance of activating, energizing, and pacifying energies. One at the same time. This interesting text also specified, or member this was thousands of years ago, air flows through the right nostril to be in synchrony with our body. We are suggested certain activities which are the best to do. These are generally those that require energy.

Guarding the borders of our territory, going out and harnessing an element, or studying scriptures. That is where the airflow spontaneously through the left nostril, they also do activities to maintain health. Such as eating our food, elimination of waste like nutrition, (unknown term) that are incidentally parasympathetic reflexes. And also sewing the land. So, these are some of the effects of spontaneous airflow through the right and left side. And why does it happen?

An ancient text says this? Why? In the next slide you will see a schematic, many people ask why the right nostril is so specific and different from the left. In the early 80s these two papers appeared where they looked at animal models to try to see what is so separate and special about the right and left nostril. That the effects should be distinct and different.

They found that there are no fibers enervating the right nostril that go through the posterior part of the hypothalamus. Where's those from the left nostril go through the anterior part of the hypothalamus. What is special about that? The posterior hypothalamus connects with the fight or flight part of the autonomic nervous system, sympathetic. Where's the anterior hypothalamus connects to rest and digest parasympathetic nervous system. This is really the essence of the major difference.

A lot of research, one of the studies, the next one please. OK, pranayama, one of the basic rhythms of the nasal's cycle can impose our will on pranayama to change it.

This is one of the most special research studies that really inspired me to do research in this area. This was done by Floyd Bloom at the scribes research Institute at California at the time. He was a neuroscientist that asked a specific question. If we breathe through the right nostril is it likely we will activate the left celebrity Burrell hemisphere? Conversely, if we breathe through the left nostril will this have an effect on the right hemisphere?

We generally have an impression that the left hemisphere is more logical and verbal where is right is more artistic. Of course this was very fascinating back in 1983 when this was published, it inspired a lot of us to take it up in neuroscience. Did we find answers? No. There's been a lot of studies on this, even now a study mentioned by (unknown name), this includes open access journal published this year, continues the query most interestingly, where the EEG signatures for this bilateral breathing.

Through the years, the last 30 years really, I have done research as later a PhD student where I set up labs before moving on to where I currently am in the north of India. I am at (unknown name) research foundation. Throughout this time, we have looked at alternate nostril breathing at a specific way. This can be seen from this, this shows it as a five-step process. Beginning with exhale on the left, as was mentioned by the previous presenter, this is followed by left side inhale, right hid side exhale and right side inhale, and then the fifth step exhale again from the left. This continues repeating that the period.

During this time excellent to use the fingers of the dominant hand, usually the right hand, so, we use the ring and little finger and the thumb. And we alternate between the two nostrils with gentle pressure from the ring and little finger and the thumb, keeping the other fingers flexed.

This is called a hand gesture or (unknown term) in Sanskrit. It's irrelevant to the rest of the

slides, that's why I'm exciting in some detail.

The next slide will show you the breath pattern, this is something very important for all pranayama and what we are currently doing in our lab. All the breathing characteristics different during alternate nostril yoga breathing? This can be called (Speaks alternative language).

You could see the pre-recording taken at rest on the left side, during practice on the right. We look at mainly the following characteristics, the rate, depth, inhale to exhale ratio, and also the force or speed of inhale and exhale.

If you look at the two patterns on the left and right, the waves look roughly comparable, however, they are bigger during the practice. Which means the breathing is deeper and a little slower.

Mind you, these are not instructions that are part of the ancient texts or descriptions of the practice. Normally people involuntarily start breathing slower and deeper as they do the cycle, no problem with that, as long as people do not over breathe.

So, giving you this introduction and what the breath looks like I will go into our research. Here you can see six different variables we have studied over the years. First we will start with blood pressure, we've done much research from the 1990s to the present time.

This was published in 2008, this slide shows that both systolic on the left side and diastolic blood pressure on the right side, measured as what a doctor would do on bedside with a stethoscope and (unknown term), it cannot be recorded continuously. We back in 2000 and 2008 when this was published, we were still recording with an old method.

Nonetheless there is a significant decrease of a small magnitude of 1 mm of (indiscernible). Later, we used a method called noninvasive blood pressure. This means we can recall throughout the time the person is practicing.

This method also goes with one more very important innovation and practice but I will mention, we found not only there was a consistent (unknown term) and systolic and diastolic but the mean arterial pressure which tells you the pressure throughout the arterial cycle when the heart is contract and relaxing, what is the big innovation and practice that is so important to mention to anyone who wants to practice alternate nostril yoga breathing? Split the practice as five-minute equals.

So, after five minutes of practice, one minute of Gap, and so on. What happened is the (unknown term) is released which makes a huge difference in all the findings we have. If the person releases the (unknown term), relaxes the fingers and brings the hand down and rested on the knees perhaps has a one minute rest before resuming.

Moving on, we did this, what about what happens during practice? We asked the question, if a person continues practicing for 15 minutes, is the last five minutes likely to have a greater reduction into the first five minutes? You can see that on the screen, the last five minutes shown as the pink bar, the first five minutes is a pale gray bar, it continues to decrease from the pre-to the first five minutes, and pink last five minutes.

What's really important for this is the splitting of the practice with one minute gap in between. With this interest we then asked the question, next slide. What about hypertensives that? People who actually have hypertension, all the other studies were normal people. First of all we shorten the duration of practice, for 15 minutes we made it 10 minutes. And we kept a gap.

Here we found a consistent reduction that was hard, even though the levels were rather high. You can see on the left side of the slide, the baseline level was over 130 mm, with that I will leave blood pressure behind and go to the next variable...

Heart rate variability, already discussed, very interesting variable, what is heart rate variability? When we run our heart rate should increase and when we sit down after running it should decrease. This is the flexibility of the heart. If the flexibility or variability of the heart is more, the heart is healthier.

If this is really healthy and flexible than the parasympathetic is (indiscernible). With that brief preamble let's see what happens to the parasympathetic alternate nostril breathing. This was a study published in 2008, at the time we used indices of heart rate variability which we felt were the based on frequency and domain indices.

They gave us intriguing and puzzling results, for the first time we found that contrary to the finding of decreased blood pleasure, the person pathetic measured here, the cardiac person pathetic was lower, it was decreased. So, is alternate nostril breathing creating an arousal at the level of the heart? We were puzzled.

We continue to research looking at different methods of practice, including the gaps as well as different indices. Sorry I think we have to go back one.

So, the time domain indices we looked at. These are much better than the frequency domains. The time domain indices are very specific for parasympathetic. Also by the time we did the studies they had started splitting the practice as five-minute practice in one minute gap. Then we started finding the specific indices which really indicate the cardiac vagal or parasympathetic tone was very remarkable and significant increase during the practice of alternate nostril breathing.

This was not just one study though I put one up as a representative strong study at the time. There were smaller studies done by students and so on in the laboratory that support this.

We were reasonably convinced that yes, alternate nostril breathing increases cardiac parasympathetic activity. And then we designed this study which was published this year. Asking a question, if it increases parasympathetic activity, can alternate nostril yoga breathing protect the heart from a sympathetic surge when we give sympathetic stimulant, a stimulant we gave which is a complex attention task.

When you do a task like this it's a surge of parasympathetic activity. During such a complex attention task, when participants practiced alternate nostril breathing, there was no sign of sympathetic surge which normally occurs. And in fact there was no change in the heart rate variability, suggesting the parasympathetic activity generated by alternate nostril breathing may

 

be having protective effects on the heart. This was published this year. We also looked at other pranayama's, it's so important in comparisons with alternate nostril breathing with other (indiscernible).

Moving on between how it affects the blood pressure and heart, the brain? What happens in the brain? When we talk of EEG, they are the brain waves, large and slow waves Delta and theta that only occur in slow meditation. And (unknown term) which only occurs when you are mentally active. So, what happens in an EEG?

You can see after alternate nostril breathing there was a decrease in beta. Whereas a contrasting finding the theta power had slower wavelengths normally seen in meditation. What does this mean if you put the two together? This means alternate nostril breathing produces a relaxed mental state characterized by low mental activity or frantic mental activity, but not as deep relaxation as very slow wave sleep or deep meditative states.

If this is the EEG, this is the brain after alternate nostril breathing capable of doing an attention task? Remember we talked about no sympathetic search. Next slide.

So, this is the attention task we gave, it's a very interesting task you give to auditory stimuli. One is like beep beep beep. Interspersed are the occasional bop and you have to count them, if the person does it well they generate a wave in their brain we can record from the scalp.

This wave occurs after 300 ms. So, we call it a positive 300 seconds or P 300. When we measure around it? We see if the wave is bigger or higher in amplitude and occurring quicker or less in latency. What did we find with alternate nostril breathing?

The peak amplitude or the size of the wave increased, what does it mean if it increases? It means the whole brain is gearing up for this attention task and function and recruiting more neural resources for the task across three sites. If you look at the left side, FZ, CZ, PZ. The first one is at the front of the brain which is given a lot of attention in fMRI studies, CZ and PZ are (unknown term). Interestingly, this has happened in a shorter time where peak latency increased.

This was not enough it was too exciting for us to leave it alone, we ought wanted to do it greater rigor as well as statistical computation which could be more complicated and in comparison with other pranayama.

So, this year, we completed the study which was published this year. What is the effect of alternate nostril yoga breathing on the P 300? And what are the effects of other pranayama's, it stood the test of the rigor. Indeed a big amplitude of P 300 does increase at the parietal cortex site. Showing us this is an effects that does stand further investigation.

Next I come to the last part of my presentation, was the effect on the mental state? The mental state we looked at in two ways, next slide.

Performance test, this is something we've been testing from of the last 10 years. If you have a simple performance task where people are asked to cancels letters on a worksheet, cancel three specific, search among the letters and cancel some of them selectively, selective attention

and shifting of attention is all tested. How well does alternate nostril breathing perform when we asked people to do this task? Does it help people perform better?

This was shown in our 2007 study but when we repeated it with more rigor as well as comparing against three other pranayama we felt or found that the effect was not as good as high-frequency yoga breathing.

However, state anxiety really does significantly increase, even when you use a greater rigor of testing and alternate nostril yoga breathing, and even when we compare it with more rigorous statistical methods compared to three other pranayama's.

In my last slide actually, if you see a comparison which we more recently did with alternate nostril yoga it still comes up as the best in reducing state anxiety, focused by bumblebee which is a whole other story and followed by (unknown term). But quiet rest has no significant effect. So, to summarize, alternative nostril breathing seems to lower blood pressure but also we need a level of evidence in trials, yes there's a lot of scope of excellent research to be continued in this area.

It seems to shift the parasympathetic, cardiac parasympathetic layers to greater pairs and pathetic dominance. There is definite tendency in the brain towards relaxation but not so great at relaxation that attention attacks cannot be done. In layman terms, if you want to perform a task but they relaxed about it, alternate nostril breathing is a good option and it reduces anxiety at the moment of testing. With that I come to the end of my presentation. I hope I'm good on time.

DR SAT BIR SINGH KHALSA:
Thank you you have kept excellent time Doctor Telles. We turn to our other guest the podium is yours.

SARASWATHI VASUDEVAN:
Thank you for a very sick synced presentation, I'm sure all participants are eager to go back and practice alternate nostril breathing with greater enthusiasm. So, I will share a few guidelines for our practice and for teaching.

Know that if you want to teach pranayama, you have to practice. It's only through practice that we really understand humans. Pranayama is much more (indiscernible) than us enough. We are really working through the breath and practice becomes important and learning from a teacher and being guided by a teacher to progress and work with that.

With that introduction, I also want to share a little bit about alternate nostril breathing techniques, what is called (unknown term). We call it in our tradition of (Speaks alternative language). It is considered the Queen of pranayama, like (unknown term) is considered the Queen of Asana. And with all the beautiful benefits that we were looking at including the improvement and attention, and therefore preparation for meditation, you can see why it is an essential technique.

So, when we look at pranayama, when you want to teach a student a and I am at practice for ourselves, it is to begin with basic breathing techniques that progressively work towards

 

alternate nostril breathing. And then there is a progression of how we can teach and practice that until you become really adept in it. And make it more certain.

Before getting into that, I want to share prerequisites, at a very practical level we cannot just jump into pranayama without preparing the body through Asana by using breath in as another (unknown term) which helps bring more and more, the mind is closer to where you are located in the body.

The preparation of the body is also to be able to sit with your back and it, with your chin down and not get disturbed by the discomfort in the body. So, it's very important to prepare the body through Asana. Another reason why it's important is because pranayama requires that we work with certain breath, unless the mind is ready to connect with their breath and stay with it, it's not easy to stay with pranayama.

So, Asana helps reduce the tendencies of the mind, the mind can become more attentive and ready for pranayama through Asana. The other prerequisites that we talk about in the second chapter, you need the guidance of a teacher, a teacher who knows your breath and how to guide you.

A beneficial and moderate diet is very important for pranayama. A diet that promotes the quality of the mind and reduces (indiscernible) in the system. And also to ensure you have eaten at least three hours before the practice, that should be enough of a gap, so, you have digested the food and are able to breathe comfortably.

Control of senses is another prerequisite, of course (unknown term) comes after pranayama in (unknown term) yoga. By keeping your eyes close and fighting time and space where you could stay with the practice without getting distracted.

And of course in our condition, (Speaks alternative language), The chain lock is considered very important as a practice to prepare for pranayama.

Now having laid out the prerequisites, I also wanted to mention and caution when do you not teach or practice an additional or alternate nostril breathing? You are inhaling and exhaling through the alternate nostrils, we have to ensure that the nostrils are clear, reasonably.

If you inhale through a partially blocked nostril it can block it more. Therefore, it can cause headaches and other kinds of discomforts. Whereas if you exhale through a partially blocked nostril it can actually clear the nostril. So, we would say if your nostrils are partially or significantly blocks, you have to exercise great caution in practicing reteaching this technique.

In the other caution is if someone has neck pain or shoulder stiffness, not to hold the hand up and do this technique for a length of time, it's not easy. You can tighten up this area further which will block your breathing. Because respiratory muscles are also you know dependent on the relaxation of the neck and shoulder area. For how they function.

Like Doctor Shirley was saying, if you can bring down your hand after five minutes of practice and rest for a minute, and then go back to it, I think it's a great way towards relaxing your neck and shoulder area.

Now benefits, we all want to know what the benefits are and of course Doctor Sat Bir Singh Khalsa and Shirley have explained those psycho and physiological benefits of alternate nostril breathing, what do the texts say about pranayama?

But the way pranayama is described in hot yoga, is (unknown term). So, you can say it is equal to alternate nostril breathing at the highest level. The benefits given are the impurities of the system are reduced.

It's not just the impurities or the base that gathers through the food or metabolism or pollution or whatever. But also the impurities we gather through the mind, the senses, the residuals that we gather in our system. All of those block the channel through which the prana is supposed to flow. So, this is considered a technique where you devise the (unknown term). This is really about purifying, so, the prana can flow through (unknown term).

That is the expiration we hold in our practice. The other benefit is that pranayama helps to prepare for meditation. So, it really helps build attention of the mind. It really helps make the mind more and more certain. The technique I will be teaching you today is how we teach and practice in the traditional (unknown term).

Of course different schools and traditions have different ways and variations of this technique and how it's taught and practiced.

I can only teach you what I have learned and what I have been practicing for close to 30 years. I have to say the beginning pranayama is not easy to learn and practice. We love to do Asana and not as interested in pranayama but once you start to regularly practice it you will see the benefits and so many levels.

For me particularly this technique took six month of regular practice to really get comfortable with it. So, do not give up very quickly is what I would say. Start practicing and just keep practicing regularly. Start with five or 10 minute practice and slowly step it up.

Progression is very important, we first work with the practice in a way that you exude the extra relation well which helps with the parasympathetic (indiscernible) and it helps calm the mind and remove impurities from the system.

Then we work on building the inhalation and exhalation through (indiscernible). Then we introduce breath retention and later other intense techniques. So, that is a way we progress the practice. So, do not be in a hurry to get to breath retention if it's done inappropriately without proper guidance it can actually cause harm.

Having said that, I want to also explain the rationale of why we teach alternate nostril breathing techniques in this way. I will explain the technique to you, and then I am going to demonstrate it, then I'm going to guide you through it. So, these are the three steps, as I'm explaining I will also explain (indiscernible).

Like Doctor Shirley was saying, this is what we call (Speaks alternative language), You bring the ring finger and little finger and thumb together. The idea is the strength of the thumb and the

 

ring finger and the little finger should be almost equal. You create a gap by folding the other two finger so you can really position it over the bridge of the nose.

Where you place your fingers if you can feel your nostrils, you can feel the bone, you can feel the soft cartilage here. You have to place it at this junction, part of your fingers are on the bone and the cartilage not down here or appear. So, (Speaks alternative language) We normally hold it like this but you cannot see how I'm holding it so I will explain it holding it like this. So, the way we teach in this traditional practice, one nostril is completely closed or blocked fully.

The other nostril is partially closed and then you exhale like Doctor Shirley mentioned. So, I am exhaling through my left nostril. It's partially closed.

Then I inhale through the partially closed left nostril with the right nostril. Then I close my left nostril, open the right partially, exhale and close.

Then I inhale through the right nostril, partially closed. The night shift to the left nostril enclose the right, so, make sure your finger is always on the nostril, OK?

This is one cycle. Left exhale, left inhale, right inhale, right exhale, left exhale. So, maybe you could start with six rounds of 12 breaths and start to progress, the text talks about 18 pranayama four times a day but maybe 24 once a day will be enough.

Now I will just demonstrate so you can watch how I'm doing it, normally we do it like this like I was saying, but I will hold it this way now. I am closing the right and exhaling through the left.

I hope you can see the very subtle way I was managing my fingers, so, the breath flows in a very subtle way. The breath has to be long and subtle. This is what we achieve through alternate nostril breathing in this way. Maybe you can practice. Hold them (unknown term). Place your hands in the junction between the bone and the Cartledge, close the right nostril fully and the left partly open. Exhale first. Inhale through the left, shift focus to the right, exhale to the right block the left, pass, inhale through the right. Exhale through the left. Would you like to continue for one more breath cycle?

Exhale through the left, inhale through the left, exhale through the right, partially blocked, left is fully blocked, pause your breath and then inhale through your right. Pause and shift the focus to the left and exhale through the left. And bring your hands down.

So, we just did two rounds, ideally at least six rounds while sitting and then slowly progressively increase it. Sick quietly and do some normal breathing before. This is how we teach and practice.

DR SAT BIR SINGH KHALSA:
Thank you so much that was an excellent presentation. We are running close to the hour, but we are happy to take questions and we will be going a little bit past the hour. Just reminding you all that this presentation has been recorded, you can access it freely online after a few days once it's put up on the yoga alliance website.

Obviously in this wealth of presentation we have more questions than we can possibly answer

 

in our Q&A session here. But we will try to do our best to address some of the questions that have been the most up a voted and most interesting questions.

One question it's probably appropriate for Doctor Tellis from Christopher, have any of these studies examine people with or recovering from COVID? If so, what were the unique findings?

DR SHIRLEY TELLES:
These studies know. But there have been studies on alternate nostril breathing as part of general pranayama practice for COVID, so, we really cannot separate them. I don't know any study exclusively on alternate nostril breathing.

DR SAT BIR SINGH KHALSA:
Thank you, another popular question is what are the contraindications of alternate nostril breathing?

SARASWATHI VASUDEVAN:
I will say if your nostrils are partially blocked obviously if you inhale through a partially blocked nostril it can create and cause a headache. So, when they are blocked there is septum deviation you must use, significantly blocked you need to be careful when you are doing this.

Of course I was mentioning to make sure problems are being attended to like pain and stiffness, that will also aggravate this technique. If you are doing a longer practice, apart from that we have to really see if this is a technique required for the student. For example, with COVID we found most people had long recoveries with blocked nostrils and throat problems. So, alternate nostril breathing was not the best technique for them at that point in time.

DR SAT BIR SINGH KHALSA:
Thank you very much. Another clinical type of question, does holding breath aggravate anxiety? This is open to either of you.

DR SHIRLEY TELLES:
Who was that for?

DR SAT BIR SINGH KHALSA:
Either of you can answer the question, does holding breath aggravate anxiety?

DR SHIRLEY TELLES:
We've done some studies on (unknown term) pranayama, there is retention. So, there is internal retention, I have not really studied anxiety per se but we have looked at other measures of physiological arousal and reduced arousal, one of the most important to gauge if a person is aroused or not is the metabolic rate.

It's very interesting that the metabolic rate can increase by 56% which is normally not seen with anyone except vigorous exercise. Two is to one, can specifically increase it. Whereas along (indiscernible) is longer than an inhale and exhale. One is two, for those instances metabolic rate and arousal increases to 19%. So, what seems to be critical is not only holding, of course you have to do it in the correct way, but the physiological (indiscernible) as nicely mentioned. But also what's very critical is the duration of holding relative to inhale.

SARASWATHI VASUDEVAN:
From practice, we have found I have really observed even when you are holding your breath it can cause anxiety. So, if it's a new class and you are focusing on inhalation by the end of the class there are a few people who may have what we call trait anxiety, it increases for them. So, this is something we have observed every time.

Of course the length of retention should not compromise (indiscernible) the inhalation and exhalation. And of course this type of variation is something we have obviously...

DR SAT BIR SINGH KHALSA:
Another popular question, we start alternate nostril breathing with left and end up with right can we start with right nostril breathing?

SARASWATHI VASUDEVAN:
You must have a certain discipline. So, when we are bringing attention, also the left nostril is the (unknown term) which is a more common and parasympathetic part of your system. So, you calm your mind before you activate it. So, activating it and, get. I would think it's better to start with the left and then moved to the right.

DR SAT BIR SINGH KHALSA:
Thank you very much, another question a little more physiological in nature, how does alternate nostril breathing ultimately activate the parasympathetic system if right nostril breathing is known to induce the sympathetic system?

DR SHIRLEY TELLES:
A nice and interesting question, when we say right nostril breathing is sympathetic and left Austral's parasympathetic, if we do it alternatively why do we shift towards parasympathetic? We thought a lot about this, even measuring the metabolites of the sympathetic nervous system and the person pathetic nervous system in urine and blood. It would appear once very important is the shift between left and right nostril actually slows down the respiration cycle and if you look at the breath characteristics. Even if the person is not told to slow down the breath, invariably it slows down. This is the key other than that nostril shifting.

I think that's why it's so important to know the characteristics of the breath, the overall breath rate during alternate nostril breathing does shift. I believe the maneuvering or manipulating of the nostrils is a way of bringing down the breath rate. And bringing about balance.

DR SHIRLEY TELLES:
I would fully agree with that, slowing down the breath is really the key and pranayama is meant to be long and slow, right? So, when that is achieved naturally the balance is achieved. We could even check it with our pulse. Once it starts slowing down your breath, the pulse evens out between inhalation and exhalation. Initially inhalers faster and exhale is slower. After sometime it slowly balances. That is something you can test.

DR SAT BIR SINGH KHALSA:
Those points are very valid, bottom-line, alternate nostril breathing is a form of slow breathing, when you do slow breathing you down regulate and balance the autonomic nervous system.

Here is a technical question.

DR SHIRLEY TELLES:
Having said that I just want to add a point here, alternate nostril breathing is a slow breathing, some of the effects are unique or fascinating between the nostrils.

DR SAT BIR SINGH KHALSA:
This question is for someone who is dominant right finger is unable to bend because of arthritis is it OK to use the other side for both nostrils.

SARASWATHI VASUDEVAN:
Absolutely, you have to train yourself and something to do get people to use both hands but they cannot hold it up for too long. So, if you can train it definitely use it.

DR SAT BIR SINGH KHALSA:
Weave a question from Julia, what about single nostril breathing? Can I use it to activate sympathetic nervous system or person pathetic nervous system?

DR SHIRLEY TELLES:
OK, yeah, of course there are some studies that indicate that, we have done some as well. It's not as easy as that, you must remember that you are overwriting the basic rhythm of the nasal cycling. So, it really starts with which nostril is dominant at the start of the practice. But yes, there are definite indications like unilateral nostril breathing can be a very powerful way of activating the sympathetic especially. Indeed the ancient texts even talk about (Speaks alternative language), As a way of energizing our systems rapidly.

DR SAT BIR SINGH KHALSA:
This is another practice question. What is the alternate of nostril breathing include partially closed, to restrict airflow?

SARASWATHI VASUDEVAN:
So, we narrow down the passage so the airflow is restricted which means you can lengthen your breath and really penetrate (Speaks alternative language), Which means to pierce (unknown term), when you partially close the nostril you are narrowing down the passage and you have the ability to pierce (indiscernible). It also makes the breath very subtle. The subtlety of the breath is very important to make the mind quiet and subtle apart from the deep physiological effects.

DR SAT BIR SINGH KHALSA:
Here is a research for Doctor Shirley, what do the acronym stand for?

DR SHIRLEY TELLES:
The very critical thing in heart rate variability is to measure the enter beat intervals. When we look at an EKG, the QRS complex, the spiky way that looks upwards in the EKG, it measures each time the ventricles that the heart contract. So, there are intervals that measure in between the times where the ventricles contract. This is measured through certain time domain indices. One of them is RM SSD, root (indiscernible) of standard deviation. What is the standard deviation between RM intervals? RM is normal to normal beat. How many exceed the standard

limit of 50 ms which is sort of the usual expected interval tween QRS complexes. So, it just tells you how much is the inter beat interval very. Normal to normal, 50 ms deviation.

DR SAT BIR SINGH KHALSA:
Thank you for that, we will take one more question here, is the practice effective for persons who cannot sit up, therefore restricted to lying in bed?

SARASWATHI VASUDEVAN:
Yes, we do teach pranayama in lying positions as well but they may have problems. The practice can be modified for the individual. Sometimes even if you cannot bring your hands to your nostrils, we even teach the practice through visualization. It's extremely effective. If possible.

DR SAT BIR SINGH KHALSA:
Take you for that answer, I want to thank both of our guests for their participation, clearly this is a topic with intense and depth and we have tried to cover it in one hour. We've done the best we've been able to do but I apologize for not answering all questions, there been many, just to reiterate this whole section of this webinar will of been recorded and available for free access on the yoga alliance YouTube page.

I invite the audience to register for subsequent sessions in the series, our goal here is to provide research on the different aspects of yoga practice and the different affects and conditions and populations a basic understanding of how yoga works. For those of you who have an interest in the therapeutic aspect, if someone you know or needs help, we encourage you to seek help from a medical or mental health professional first before you engage in any of these practices on your own. So, thank you very much for attending this webinar, we look forward to seeing you again in a future presentation.

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