

Evaluating the Effectiveness of 3D Animated educational videos with timers - aiding in Fear control & increased holding time of Upside down Yoga pose Halasana**Jeevalatha.G****Dr.M.G.R Educational & Research Institute****Abstract:**

3D animation is a form of educational media that aids in assisting viewers in better understanding concepts. Breath control, mind control, and general physical wellness are all aided by the physical, mental, and spiritual practices of yoga. Upside-down yoga poses give a lot of health benefits, but people don't practice them due to fear of pain and falling down. The purpose of this paper is to determine whether 3D animated instructional videos can assist people who practice yoga at home in performing upside-down yoga poses without worrying about hurting themselves or falling. With all the simple instructions for how to perform the upside-down yoga stance, a 3D animated model (3DYOGI) was developed where the posture is split into 10 easy guiding steps. The survey approach is employed, and Purposive Uniform Sampling is done. A questionnaire is provided to them initially, and 30 days after the usage of 3DYOGI, the same set of questionnaires is given. Of the 12 samples, 10 were taken for analysis, and the remaining two are outliers. They were tested weekly to determine their performance level. The results showed that 3D animated instructional video helped them to perform Halasana, an upside-down yoga pose easily. At the conclusion of the 30 days, they were able to maintain that position for a longer period of time, and their fear of falling down & pain and worry of losing their balance had diminished, as evidenced by the time it took them to return their leg to their original position. 3D Animated guiding videos, with explanations and timers, help people to do tough asanas without fear. People who have health-related issues can use this 3DYOGI, to do it step by step as per their pace and get benefits after consulting with their physician.

Keywords : 3D Animation , timer videos, halasana, fear of falling

1.Introduction:

Animation is consecutive changes that is made to an image which is viewed rapidly within a short duration of time, that has been illusioned as motion due to the Principle of Persistence of vision. 2D animation is created where only the length and breadth is taken for creating characters or images, whereas 3D animation takes length, breadth and width. Graphically animated content have the finest and positive impact in learning and understanding the concepts more easily and memorably (Zahra, 2016)(Syeda Binish Zahra) Even the experiments that we used to study in Physics in school days, we used to imagine and study when it comes to the working of the machines, the diagrams that are given in the books helps us to understand a little better when compared to normal text, whereas the same working of the machine will be well understood better if it is created in 3D dimensions and the working is animated and shown. So we understand exactly what is been taught, rather than imagining something that is irrelevant to the course content. 3D Animation is well known in the Film industry, but its contribution to the education and web sector is relatively high and as per NASSCOM report released in the year 2019 (NASSCOM, 2019). Even for virtual reality 3D models will be created first and 3D VR finds its innovative applications of teaching, learning, and training (Jou and Wang, 2013). Since 3D is used more in education, yoga taught through 3D animation is been taken for this research. Yoga is a Sanskrit word with a general meaning of "connection, conjunction, attachment, union" (Anon., n.d.) a generic term for several physicals, mental, and spiritual disciplines originated in ancient India. The union of the body, mind, and spirit achieved through disciplined practice is Yoga. (Iyengar, 1966). It emphasizes physical postures, breath control, and mental concentration to attain balance and well-being. We can do Yoga as a part of exercise even as a part of therapy. When Yoga is done as a practise it includes different yoga postures where we have to maintain in the same postures for minimum 5 counts to a maximum of 40 counts and above and also breathing exercises called as Pranayama in general and ending up with relaxation by lying down. This type of Yoga for exercise is popular across the world, and it is called as Hatha Yoga (MD, 2021). Yoga is also aiding in lot of healing therapies. Nowadays People do Hatha yoga at home after getting trained in a Yoga Training Centre and then they continue their doing at home. When people do Yoga at home on their own, recollecting what is taught in the class or seeing the yoga pose charts, they fear to do tough yoga poses. Upside down Yoga poses like Sarvaangaasana, Halasana, activate the thyroid gland, improve digestive function, and balance the endocrine system, which may aid in maintaining a healthy metabolism and body weight. (Sarawati, S.S., 2008) Practising regularly, inverted yoga postures, including Sarvangasana and Halasana, promote chest expansion, improve breathing mechanics, and enhance respiratory muscle function through thoracic stretching. (Fishman & Saltonstall, 2008). While people start practising at home they tend to do the regular forward bend asanas but they are hesitant to do backward bend and upside down poses due to the fear of falling or fear of pain. When a trainer does it along with them, they will try to attempt it, but in general people don't attempt to do it all alone. Also going every day to Yoga centre is money and time involved, so based on the initial training class they attended, they continue to practice at home ending up in not doing difficult poses, which has health benefits. 3D animation plays a major role in films, e-content creation, and advertisements. The advantage of using 3D is, once the model is created, it can be moved and rotated in all angles. The time taken to create a 3D model could be more, but it will help in the transformation of objects like bend, scale and stretch. 3D animation always gives the end user a better understanding. In our article, we are going to take the advent of 3D and use it to create models which will be like a trainer to the home practice people to aid them in better doing of difficult poses.

Review of Literature:**3D Animation:**

Animation has become an integral part of human life starting from kids' education to medical studies. According to Richard E. Mayer (2009), multimedia that integrates animated images with audio amplifies children's attention and learning by engaging both visual and aural processing. In 3D animation all the views of a character or an object can be seen, since every character is modelled fully. With the usage of 3D cameras every modelled object can be viewed in all viewpoints, the left view, right view, top view, bottom view and perspective view. In 3D software like 3dsmax, Maya, Blender, the viewport is the area where the user created objects can be viewed by the users. The active viewport is always highlighted (Autodesk, 2020). Also, the application allows the users to change the viewpoints according to their scenes. The viewpoints can be viewed from different angles with the help of the cameras. We can make a viewport as a camera viewport as well, where that object will be available for the scene according to the angle of the camera. The perspective camera views the scenes with a depth also when the camera focal length is more the objects look smaller and when it is less the objects look bigger. Though the object size is the same, according to the view of the camera lens the objects look bigger or smaller. For example, in 3D modelling software like 3ds Max or Blender, multiple viewpoints display the 3D forms from different angles and projection modes. When it is an orthographic camera view the object is viewed in the same as it is seen in the scene as per the measurements we have made means the creation time of 3D models will consume more time and also the output has to be rendered to get the final look. All realistic materials can be created or can be taken from libraries including metal finishes fire effects and so on. Three-dimensional (3D) objects exhibit enhanced realism as they can be observed from various angles, enabling designers to evaluate and enhance every facet of the model. Moreover, the utilization of colours, materials, textures, lighting, and rendering techniques augments the visual reality of 3D things (Alan H. Watt, 2000; Samuel R. Buss, 2003). All realistic and real time images also can be used to wrap the 3D objects, so that the output looks real. Keyframes are the one where the change in the object happens and which is the reference point for the change to start happening. 3D object after completion has to be rendered, which gives the final output with all the lightings and materials we can apply. A texture map is wrapped on the mesh object using the texture coordinates. The realistic output is achieved because of the detailing that can be done in 3D meshes, even the smallest vertices to face of the mesh, and segment can be altered and even colored, or materials can be applied to the particular face as well.

Inverted Pose - Halasana:

Halasana is also known as Plough Pose, Hala means Plough and asana means pose. Halasana is also called as Plough Pose the reason is the final posture of the body when we do this asana will be like an Indian plough – which is farming tool. It is a Sanskrit word and pronounced as hah-Lahs-ah-nah and it helps in strengthening of upper body and back. (editors, 2021) Your feet are over your head," says *Yoga Journal* senior editor Tamara Jeffries. It helps prevent and relieve tightness in your neck, shoulders, and back. (editors, 2021) The pose also strengthens your shoulders, arms, and legs. It is also known as inversion circulation pose practising regularly it gives flexibility and improves muscle and joint mobility (Ramzi, 2022). This pose is performed by lying on the back and lifting the leg with the help of the hands holding the hip and touching the floor, the feet must be kept behind your head and it should touch the floor. The health benefits of this pose include **Improved digestive system:-** In the current scenario, due to the availability of mobile apps and people delivering food in the door steps, the eating habits of people have changed drastically and the consumption of Junk food has increased and improper eating lifestyle leads to constipation and indigestion and lot more issues. Every part of the digestive system helps to move food and liquid, and it breaks these into further smaller parts. Once it is broken

into smaller parts our body absorbs and move the nutrients to whenever it is required (Rodgers, 2022). Halasana helps in proper digestion and in the absorption of nutrients from the food that we intake (Chavan, 2022). **Relieves stress:** - The Halasana is a proven remedy to help relieve anxiety and stress-related problems. Along with breathing exercises, this asana provides relaxation to the mind. (sullivan, 2021). **Manages Diabetes:** Yoga expert Manisha Kohli, says yoga can also prove to be extremely beneficial in controlling diabetics. Practicing Halsana helps in the secretion of insulin in the body in turn controls the blood sugar level and minimises the risk of developing type-2 diabetes. (Anon., 2022). **Stimulates thyroid glands- This pose allows blood to reach the upper glands like pituitary, thyroid glands and hence stimulates the endocrine system, which in turn helps in the better functioning of the thyroid gland.** therapeutic for leg cramps, while doing this pose, the leg muscles get stretched and which in turn enhances the flexibility of the muscles that causes cramps. improves blood circulation, helps during menopause, hair growth: due to the inverted pose, blood flow gets diverted to reach the tips and roots of the hair. As mentioned, the Plow pose involves reverse circulation of the blood, i.e., it diverts the blood flow from the lower extremities to the upper extremities of the body. This asana helps blood to reach the tips of all glands and nerves, thereby promoting blood circulation. The Plow pose benefits during menopause by relieving stress from major points. It massages the neck, shoulder, and spine in the correct posture. The asana is also known for relieving symptoms of stomach disorders. **9) Strengthens Immune System:** The Plow pose helps to circulate the blood to every tip of the nerve endings. It improves the immune system by strengthening the system and flexibility of each of the muscles. **10) Halasana Benefits for Hair:** The Plow pose involves the individual lying down in a pose that diverts the flow of blood. This helps the blood to reach the tips and roots of the hair. Regular practice of the asana helps in the necessary blood circulation. Yoga is considered as a compliment to drug therapy and as a non-pharmaceutical measure for diseases like mental stress, diabetes, obesity etc. (Woodyard, 2011) *Asanas* are reported to help in improving physical strength and flexibility, it is argued to also help in building concentration (Cowen VS, 2005.) **Need of the Study:** The incorporation of 3D animation in instructing Yogasanas, especially complex pose halasana – upside down pose, offers a precise and realistic depiction of body alignment, posture, and movement from many perspectives. This aids practitioners in comprehending intricate postures with greater precision, reduces the likelihood of erroneous practice and accidents, and bolsters confidence in self-directed learning. This also assists practitioners in maintaining the inverted stance for an extended duration with timers, while challenging intermediate poses are facilitated by the use of external objects. This study seeks to assess the effectiveness of 3D animation in improving the learning experience with confidence and without the fear of falling down.

4. Objectives:

- 1) To evaluate whether 3D Animated guiding videos along with timers help people to do Halasana without fear.
- 2) To analyze whether fear of falling tends people to bring back the legs to normal position immediately while attempting to do Halasana – upside down pose.
- 3) To find out whether fear of pain in the neck stops them from trying to do Halasana.
- 4) To understand whether 3D Animated guiding videos can help people to be in the upside-down pose for a longer duration.

5. Methodology:

1. Survey in the age group of 40 to 50 yrs.
2. 3D animation (3DYOGI) demonstrating the poses to be created for experimenting
3. Observations to be done weekly once for 4 weeks
4. Telephonic Interviews

6. Hypothesis Set for Paired T-Test:

- 1) There is no significant difference in the time taken to do Halasana before and after the usage of 3D animated timer videos
- 2) There is no significant difference in the time taken to bring back the legs to the normal position due to pain, before and after the usage of 3D animated timer videos
- 3) There is no significant difference in the time taken in holding the upside-down pose by people, before and after the usage of 3D Animated Videos
- 4) There is no significant difference between gender in bringing the leg to the normal position, fear of falling and fear of pain

Analysis revealed that people who did yoga along with the aid of 3D animated timer videos could do this upside-down pose, and the time taken for them to hold in the same position is more, when compared to the people who did it with the help of Youtube videos.

Yoga contributes mainly in the wellbeing and activation of all the body parts. Upside-down yoga poses help to keep the thyroid glands and spinal cords active and healthy.

As human beings, we always fear standing upside down since it is not in the routine.

10 people were selected who are doing yoga at home after attending some classes, and who were trying to do Halasana at home by watching Youtube videos but couldn't achieve it. The survey was conducted with them with the structured questionnaires

The same set of people has been asked to follow the timer videos that are created to do Halasana.

Weekly once, a review was taken. Total 4 weeks were taken to analyze this.

People watching YouTube found it difficult and also the fear of standing upside down didn't allow them to practice, Cronbach self-efficacy test was taken in the beginning, and the score was 4 out of 9 and it was 8 out of 9 after using the 3D videos.

Whereas 3d animation video helps the people to do it easily since it guides them with easy steps and it also to do it along with them, which made the team encouraged to do it. While doing difficult poses, we feel that we are in that position for a longer time and we will tend to come back to our normal position. In yoga classes, the trainer used to say the count, whereas for home practitioners no trainer or assistance will be there. These videos along with the timer, help them to be in position till they hear the sound. The self-efficacy was low in the beginning for doing upside down yoga poses and it increased to a level of 50 % and above after practicing it with pose wise with the help of 3DYOGI

7. 3DYOGI Video

3D model of a woman is created using the 3D animation software and based on the instructions and guidance got from the professionals the yogic pose Halasana is split into 11 different sub poses which can be performed each day. 3DYOGI is a special kind of animated video, where participants are taught the easy methods to achieve this pose. Lot of discussions were made with professionals who do this pose.

Pose 1 is the pose where the participant will lie down and lift her legs resting on the walls vertically where the head and the upper body will be in the floor.

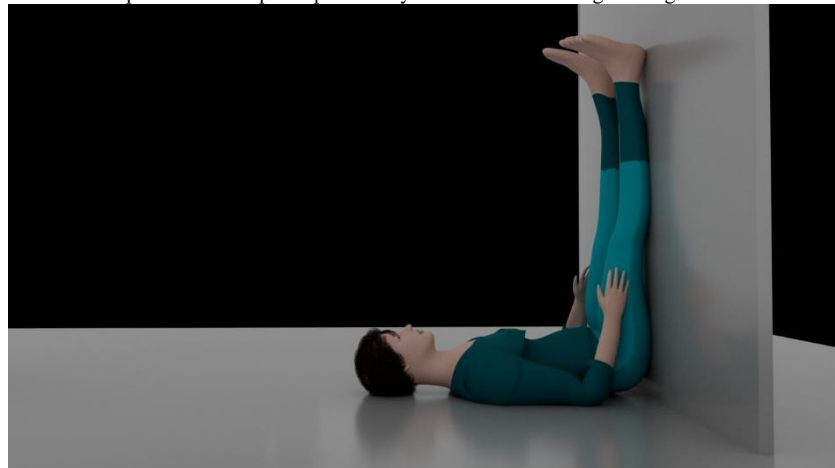


Fig 1.1 : Pose 1

Pose 2 is keeping a pillow at the back that is under the butt to lift it a little higher, the leg position remaining the same as the initial pose. By repeating this Pose 2 for a minimum of 3 to 5 days the body gets used to lift its butt to a particular height which is nothing but the height of the pillow.



Fig 1.2 - Pose 2

Pose 3 is adding one more pillow on top of Pose 2, so that our upper body gets lifted much more up, and the legs also will go up. Practicing Pose 3 for 3 to 5 days makes the participants lift their butt up at an average of half a feet and more above the ground level. Now that the participant is comfortable in lifting her butt up, also since they are resting the upper body in the floor and using the hands to support the hips in the lifted level, and legs rested in the wall, the participants will not have the fear of falling.



Fig: 1.3 – Pose 3

The fear arises when they try to bend their legs upside down.

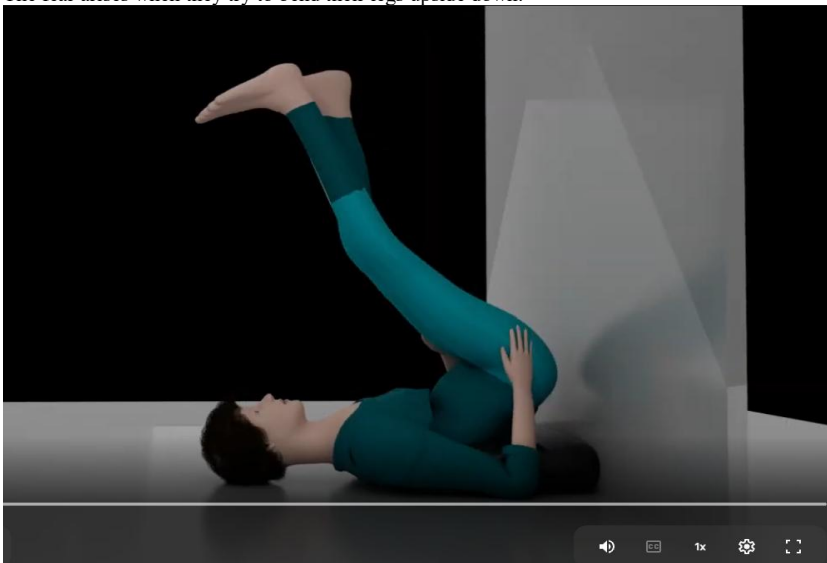


Fig 1.4 : Pose 4

To make this easier and to avoid the fear of falling the bent leg will be kept on a sofa top or a chair top as in Pose 5

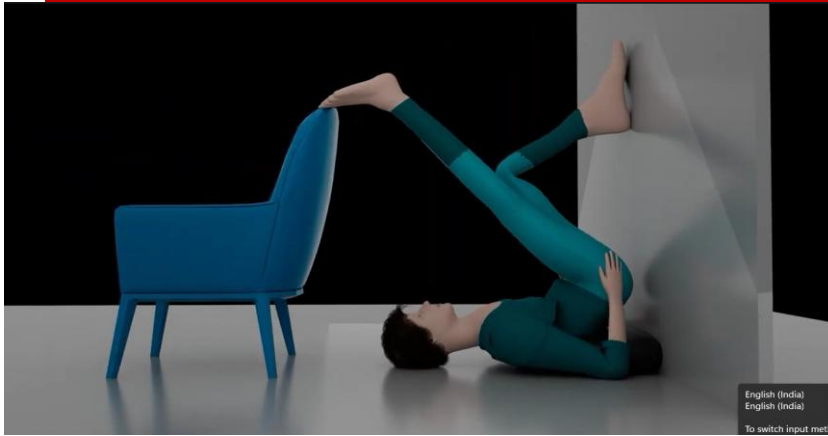


Fig 1.5 : Pose 5

Pose 6 gives them a safe feeling, the reason is their upper body is on the floor, they are holding their hips with their hands, and the legs are rested on the sofa top.

Practicing Pose 6 for 3 to 5 days makes the body get used to the position.

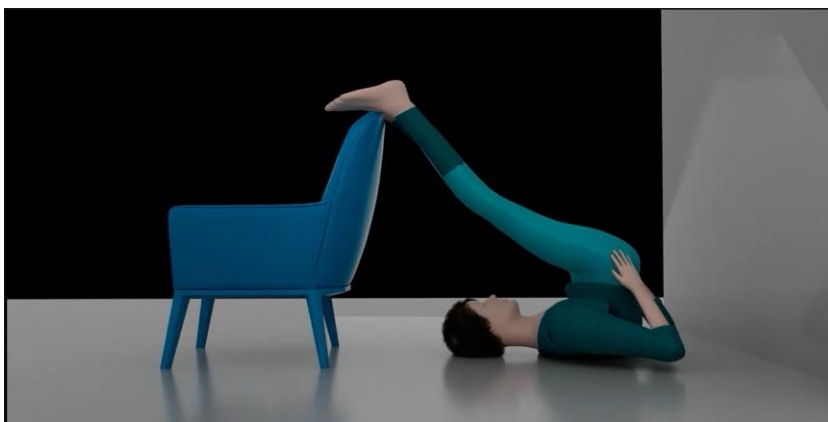


Fig 1.6 : Pose 6

Pose 7 is trying to keep the leg toes on the sofa sitting area with a pillow added to the sofa or cushion added to the chair.

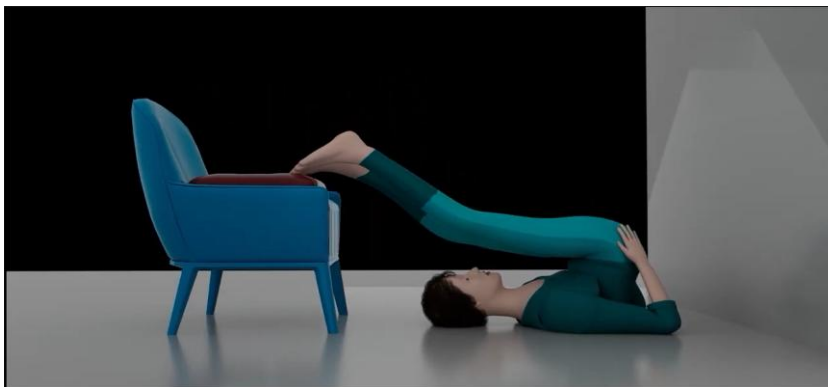
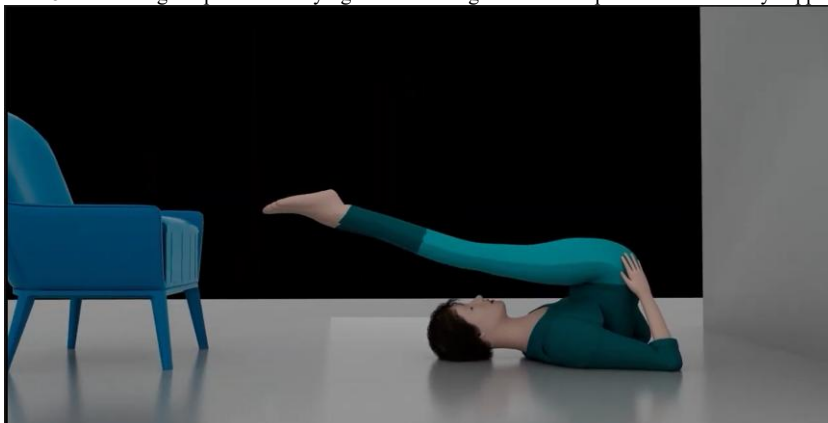


Fig 1.7 : Pose 7

Pose 8 is removing the pillow and trying to hold the legs in the same position without any support



Pose 1.8: Pose 8

Pose 9 is removing the chair or sofa and trying to rest the legs on top of 2 pillows,



Pose 1.9 : Pose 9

Pose 10 is to rest the leg after removing 1 pillow and resting on 1 pillow alone.



Fig 1.10 : Pose 10

Fig 1.10: Pose 11 is to remove the pillow and resting the leg to ground with the body bent fully upside down.

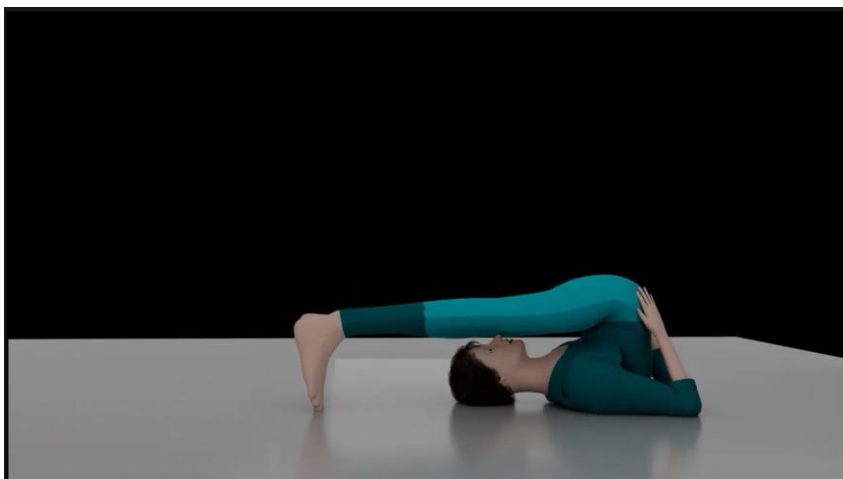


Fig 1.11 Pose 11

In a period of 30 days people can reach this full upside bend pose . As per the 3D animated timer video on regular practise with the aid of external supporting objects and timer, people can achieve this upside down pose in 30 days regular practise.

8.Statistical Analysis:

Table 1.1 Paired t test for significant difference in fear of falling before and after the usage of 3D .

Mean	Mean after using 3D	SD	Sd after using 3D	t value	P value
1.3	2.7	0.483	1.059	6.332	0.001

Table 1.1

Since P value is less than 0.01, the null hypothesis is rejected at 1% level of significance with regard to all the hypothesis 1 and alternate hypothesis is taken and statistically proved that there is a significant difference, the time taken to bring back the legs to the normal position is more after using the 3d Video when compared to the one they did before, the mean value and sd values of 2.7 and 1.059 proves it. However, the actual fear of falling may be experienced by someone who has never actually had a fall. (Stephen Harding, 2008). Only the fear stops them from holding in the position for a longer time. Also while doing Halasana, the first posture is Sarvangasana and from there it goes to halasana. The resting heart rate and left ventricular end-diastolic volume were significantly reduced

on practicing Sarvangasana (DEBBINDU KONAR', 2000). The practice of Halsana is good for health and since due to fear of falling people who practice at home don't do it and this 3D timer videos helps them to get benefited which is been proved statistically

Table 4.3.3 Paired t test for a significant difference in the holding time before and after the usage of 3D.

Paired Samples Statistics							
Remarks	Mean	N	Standard Deviation	Standard deviation error Mean	t	p	
The upside down holding time – YouTube	2.605	10	0.269	0.085			
The upside down holding time – 3D Animated Timer Video	6.590	10	2.412	0.763	5.47	0.0004	

Table 1.2

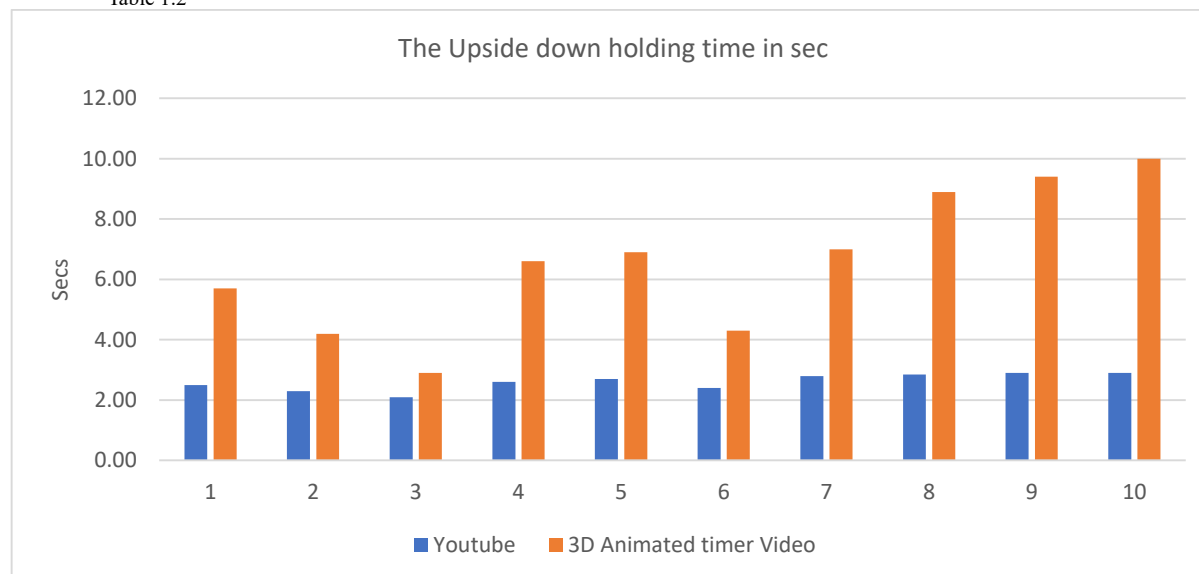


Fig 1.11 -Upside down holding time in Secs before and after usage of 3D animated timer video

Since P value is less than 0.01 the null hypothesis is rejected, and the alternate hypothesis is accepted stating that there is a significant difference in the holding time of upside-down pose with the help of the 3d timer videos. People were able to hold in the upside-down pose for a longer duration when compared to earlier practise time of seeing YouTube videos. The timer also plays a role in pushing the people to hold the position. The paired sample t-test revealed that the upside holding time after the usage of 3D animated timer video is significantly higher than YouTube video the p value being 0.0004. People with intensive physical work, mainly doctors have been found to be efficacious in the alleviation of chronic lower back pain when they do yoga. (Karen J. Sherman, 2005) . Yoga benefits particularly for those under considerable amounts of stress. (Anon., n.d.)

t test for no significant differences between Males and Females with respect to factors related to fear of falling

	Male	Female	t value	P value
	mean - SD	mean - SD		
Fear of falling	21.20-1.92	20.00-1.87	1	0.0173

Table 1.3

Since the P value is 0.0173 reject the null hypothesis at 5 % level of significance, there is no significant difference among male and female with respect to the factors related to fear of fallings.

t test for significant difference between Male and Female with respect to time taken to bring back the legs to supine position after using 3D

	Male	Female	t value	P value
	mean - SD	mean - SD		
fear of falling	2.40-0.548	3.40-1.342	1.543	0.081

Table 1.4

Since p value is more than 0.05 accept the null hypothesis at 5 % significant level. The Female were able to keep the legs in the upside down for a longer duration, the higher mean values proves it significantly. These researchers prove that superior aerobic fitness is more excellent in women, indicating that women are naturally more fit than men (Anon., n.d.) The experience of doing yoga is similar between males and females but there is a small difference in the yoga practice between men and women (Anon., 2017).

	Paired Samples Test					t	df	Sig. (2-tailed)
	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Tried doing halasana but fall down due to fear 3D Timer Tried doing halasana but fall down due to fear YouTube	2.700	.823	.260	2.111	3.289	10.371	9	.000
Confident in doing Halasana – 3D Confident in doing Halasana-YouTube	-2.700	.949	.300	-3.379	-2.021	-9.000	9	.000
3D - The time taken to bring back the legs to normal position Youtube :The time taken to bring back the legs to normal position	-3.300	.675	.213	-3.783	-2.817	-15.461	9	.000
3D: Fear of pain bring back the legs to the normal position in less than 3 secs – Youtube : Fear of pain bring back the legs to the normal position in less than 3 secs	2.800	1.033	.327	2.061	3.539	8.573	9	.000
3D: Fear of pain while doing upside pose has reduced. – Youtube : Fear of pain while doing upside pose has reduced .	-1.500	.972	.307	-2.195	-.805	-4.881	9	.001
3D : Fear of falling down in the upside down pose has reduced Youtube : Fear of falling down in the upside down pose has reduced	-2.400	1.075	.340	-3.169	-1.631	-7.060	9	.000

All the above six factors, fear of falling down, fear of pain in neck, confidence reveals that doing halasana by seeing 3D timer video is helping people in doing it without fear and they can hold it for a longer time, and it is highly significant with a $p < 0.001$, at a higher level of significance at 1%.

Cronbach's alpha – General Self efficacy scale and 4 video interviews were taken. Self-efficacy refers to an individual's belief in his or her capacity to execute behaviours necessary to produce specific performance attainments (Bandura, 1977, 1986, 1997). Improvements were seen in the Self-efficacy scale. Self-efficacy reflects confidence in the ability to exert control over one's own motivation, behaviour, and social environment. The self-efficacy for exercise scale (SEE) is a self-reported scale that helps one gauge how they are feeling about their exercise habits. (Resnick & Jenkins, 2000).

Findings : 3DYOGI help them in doing upside down pose easily

- Timer helps them to retain their upside-down position for a longer duration
- People were able to do difficult poses, if a trainer does it along with them every time
- The fear of falling down got eradicated since they were guided step and step
- The fear of pain reduced since regular practice along with the calculated timers will not lead to pain
- People find it easy to do the upside-down pose when they are guided with timer 3D videos.

9. Discussion

3D Animation has been done, and then it divided into 10 day wise videos along with timers. Ten individual poses were done and the video has verified for perfection by Yogisri Govindaswamy. The whole video which contains the easy method of doing, whenever they were not able to lift the legs how to use supporting materials to make the body to get used to that pose. Easy objects which were available in the house itself has been used as a supporting aid to achieve this pose easily and a day wise split up video was given to the experimental group. All were given the full video which contains the overall performance of the posture with the help of the supporting materials and also a day wise split up video was also given for experimentation. The whole video was given to the people who were taken for experimentation. A briefing was given and the people were given the videos and asked them to practice as per the order. Weekly once they have been asked to come for a video call, and the progress was noted, and also checked whether they have any difficulty. Self-efficacy tests were taken in the beginning, before the yoga video was given and set of questions were asked and the same test was repeated after the practice with the help of the timer videos. People had the fear of falling till they were doing pose 6 to pose 7, and the time taken to hold the position was 2 sec to 3 secs before, and now it is 5 to 10 seconds. Since it is a day wise and position wise practice which guides people to do it in an easy manner. Also, when we are in the upside pose, it gives a feeling that they are in that position for a longer time and people will tend to bring it back to normal position, whereas 3DYOGI has a timer for 30 secs for each pose, the timer sounds helps them to retain in the same position for a longer duration. The self-efficacy score was 4.33 on average and it is 7.12 after using 3DYOGI.

10. Conclusion:

3D animated timer video (3DYogi) shows people how to perform the upside-down yoga pose Halasana correctly and easily without difficulty or the fear of falling. Difficult yoga poses can be performed at home if people are provided with animated easy stepped timer videos which they can use by keeping it on their mobile and playing it while completing. The timer encourages them to hold it for a longer length and to bring to its original posture. People can perform the upside-down yoga pose more quickly, correctly and painlessly without having the worry about toppling over. This is made possible through 3D animated timer video, and the statistics confirm the same. If people are provided with animated timer videos that they can use by keeping it on their mobile device and playing it while doing, they can perform challenging yoga poses at home on their own. The timer will assist them to hold the posture for a longer period of time and return to the starting position, 3DYogi will be given to people for use at no-cost for social causes since this gives lot of health benefits. Future studies will be on 3D animated timer videos for difficult poses and will be made as an application that can be made available free for download.

References:

- Anon., 2017. *gender & yoga practise is there any relationship*. [Online]
Available at: <https://www.yoganatomy.com/gender-and-yoga-practice/>
- Anon., 2022. Manage diabetes with these yoga asanas. *The Indian Express Journalsim of Courage* , 29 nov.
- Anon., n.d. *Blog - Fitness*. [Online]
Available at: <https://betterme.world/articles/are-women-more-flexible-than-men/>
- Anon., n.d. *Halasana In The Hospital: Yoga To Be Offered To NHS Staff*. [Online]
Available at: <https://themindedinstitute.com/halasana-in-the-hospital-yoga-to-be-offered-to-nhs-staff/>
- Anon., n.d. *healthshot.com*. [Online].
- Anon., n.d. *Plow Pose (Halsana)*. [Online]
Available at: <https://yogajournal.com>
- Anon., n.d. *Wikipedia*. [Online].
- Autodesk. (2020). *General viewport concepts*. Autodesk Help.
<https://help.autodesk.com/cloudhelp/2020/ENU/3DSMax-Basics/files/GUID-368DCAE3-4118-4539-853F-C25B7D56EF3F.htm>
- Buss, S. R. (2003). *3D computer graphics: A mathematical introduction with OpenGL*. Cambridge University Press.
- Chavan, D., 2022. *halasana-for-better-digestion-healthy-skin*. [Online]
Available at: <https://www.credihealth.com/blog/halasana-for-better-digestion-healthy-skin/>
- Cowen VS, A. T., 2005.. Physical and perceptual benefits of yoga asana practice: results of a pilot study.. *Journal of Bodywork and Movement Therapies.*, p. 211–219..
- Debbindu konar', r. L. A. J. S. B., 2000. Cardiovascular responses to head-down-body-up. *Indian J PhyaioI Pharmacol* , pp. 392-400.
- Editors, Y. J., 2021. *Outside. yoga journal*, dec.
- Fishman, L. M., & Saltonstall, E. (2008). *Yoga for osteoporosis*. W. W. Norton & Company.
- Iyengar, B. K. S. (1966). *Light on yoga*. George Allen & Unwin.
- Jasien JV, J. J. d. M. C. R. R., 2015. Intracular pressure rise in subjects with and without glaucoma during common yoga positions. *PLos One*, pp. 10-12.
- Karen J. Sherman, P. M. D. C. C. P. J. E. R. M. P. D. L. M. P. a. R. A. D. M. M., 2005. Comparing Yoga, Exercise, and a Self-Care Book for Chronic Low Back Pain. *Annals of Internal Medicine*.
- Mani, U., 2021. *11 Amazing Halasana (Plow Pose) Benefits & How to Do It!*. [Online]
Available at: <https://bebodywise.com/blog/halasana-benefits/>
- MD, T. M., 2021. *Yoga Journal*. [Online]
Available at: <https://www.yogajournal.com/lifestyle/health/womens-health/count-yoga-38-ways-yoga-keeps-fit/>
- Mayer, R. E. 2009. *Multimedia learning* (2nd ed.). Cambridge University Press.
- NASCOM, 2019. s.l.: s.n.
- Ramzi, 2022. shvasa. *How to manage Stress and anxiety with Yoga* .
- Rodgers, D. P., 2022. *Digestive system how it works*. [Online]
Available at: <https://www.niddk.nih.gov/health-information/digestive-diseases/digestive-system-how-it-works>
- Saraswati, S. S. (2008). *Asana pranayama mudra bandha* (Rev. ed.). Yoga Publications Trust.
- Stephen Harding, A. G., 2008. Fear of falling. *Australian Journal Of advanced nursing*, pp. 94-100.
- Sullivan, c., 2021. *healthline*. [Online]
Available at: <https://www.healthline.com/health/fitness/benefits-of-halasana>
- Watt, A. H. (2000). *3D computer graphics* (3rd ed.). Addison-Wesley.
- Woodyard, 2011. Exploring the therapeutic effects of yoga and its ability to increase quality of life. *International Journal Of Yoga*, pp. 49-54.
- Zahra, S. B., 2016. Effect of Visual 3D Animation in Education. *European - American Journals*, pp. 1-9.