

Review Article

ISSN: 2320 5091

Impact Factor: 4.018

A SCIENTIFIC AYURVEDIC EXPLORATION OF CONCEPT OF SLEEP (NIDRA)

Pooja Sabharwal¹, Sonali Shilpa Ekka², M.B. Gaur³, Yogesh Kumar Pandey⁴, Amit Kumar Sharma⁵

¹Assistant Professor, PG Department of Rachna Sharir, ²PG Scholar, Department of Kriya Sharir,
 ³Prof. & H.O.D., PG Department of Kriya Sharir, ⁴Associate Professor, PG Department of Kaya Chikitsa;
 Ch. Brahm Prakash Ayurved Charak Sansthan, Khera Dabar, Najafgarh, New Delhi, India;
 ⁵Associate Professor, Department of Rachna Sharir, A&U Tibia College, New Delhi, India

Email: drpoojasabharwal@gmail.com

ABSTRACT

Sleep plays a very essential role in our well being and good health throughout our life. If a person gets enough good quality and quantity of sleep in his/her day to day life, it provides many benefits including good health, good life span, protecting mental and physical health. During sleep, your body is working to support healthy brain functions and maintain your physical health. In children and teenagers, sleep also helps in growth and development of body and mind. Regular and good quality sleep is important for proper brain functioning, emotional wellbeing, physical health and daytime performances and activities. As we all know that adult needs 7-8 hours of sleep each night to be well rested. A night of good and relaxed sleep is incredibly important. In fact, it is as important as food to our body. Nowadays People are sleeping less than they used to did in past as a result sleep quality has decreased. Sleep is very important for various aspects of functions of brain. This includes cognition, memory, concentration, performance and productivity. Due to sleep deprivation many sleep disorders can occur such as anxiety, depression, stress etc. and poor memory, difficulty focusing, excessive daytime sleepiness, lethargy, tiredness, morning headaches etc. can occur. Sleep is just as vital to our growth and development as breathing air. No matter what age you are, sleep plays a role in helping your body reset, repair, and regenerate. In Ayurveda, *Nidra* (sleep) comes under tripod of life i.e. support or pillar of life.

Keywords: Nidra, Insomnia, hypersomnia

INTRODUCTION

Sleep is an unconsciousness from which the person can be aroused by sensory or other stimuli. Duration and requirement of sleep varies with age and individual. It varies from person to person. On an average a human subject sleeps for 1/3rd of his life¹. According to Ayurvedic view point, *Nidra* is functionally important. It is an essential physiological phenomenon which occurs in our day to day life. Since it is a part of normal physiology, it gives rest and relaxation to our body, mind and senses, which gets tired and exhausted due to wear and tear process occurring in our daily life. When mind is exhausted and *indriyas* withdraw themselves from their object then the individual sleep². Hence, *nidra* is considered as one of the essential components of life. In our classical texts, *Ahara*, *Nidra* and *Brahmacharya* are given primary importance under tripod of life i.e. *'Trayopastambah'*. When these three are practiced well in our life, it will provide strength, complexion and compactness to the individuals' body³.

Nidra when taken properly in good quality and quantity will provide Sukh (happiness), Pushti (nourishment and growth), Bala (strength and immunity), Vrishta (potency and sexual vigor), Gyaanam (knowledge and intellect) and Jeevitam (good life span and longevity of life). On the other hand, an abnormal sleep in terms of quality and quantity (inadequate, excessive or irregular) will provide opposite qualities or the harmful effects i.e. Dukh (grief and misery), Karshyam (weakness or emaciation), Abalam (loss of strength and immunity), Kleebata (impotency and sterility), Agvanam (ignorance and non-intellect) and Ajeevitam $(death)^4$.

Nidra has been described as one of three essential supports for the health. Both the less and excessive conditions of sleep are harmful to health. The three triads of life or the three supports i.e. *Ahara*, *Nidra* and *Brahmacharya* designated as *Upstambhas* or the

secondary supports of life. Proper and undisturbed sleep is one of the most important factors of the life. Acharya Charaka, describes that happiness, misery, nourishment, emaciation, strength, weakness, virility, sterility, knowledge, ignorance, life and death. Like proper diet, proper sleep is also very essential for the maintenance of the body. The sleep when properly enjoyed, brings about happiness and longevity in human beings as the real knowledge brings about siddhi i.e. spiritual power in yogi's⁵. Sleeping and awakening in right and balanced quantity quality proceeds an individual towards happiness.

Nidra is a very important phenomenon which provides rest and relaxation to the body, mind and senses when they get tired and exhausted. When the mind including sensory and motor organs is exhausted and they dissociate themselves from their objects, then the individual sleeps.

According to *Acharya Sushruta*, *Hridya* is the seat of consciousness and when it is dominated or covered by *tamas*, and then the person gets $sleep^6$. It is a natural process.

TYPES OF SLEEP

Table 1: Different opinior	ns of various Acharya's -
----------------------------	---------------------------

AC	CHARYA CHARAKA ⁷	ACHARYA SUSHRUTA ⁸	AACHARYA VAGBHATTA ⁹		
1.	Tamobhava	1. Vaishnavi Nidra	1. Kalasvabhawajanya Nidra		
2.	Shleshma-samudbhava	2. Tamsi Nidra	2. Aamayjanya Nidra		
3.	Manah-sharir-shrama-sambhava	3. Tamobhuyishtha Nidra	3. Chitta-khedajanya Nidra		
4.	Aagantuki	5. Satvabhuyishtha Nidra	5. Kaphajanya Nidra		
5.	Vyadhyanuvartini	6. Vaikariki Nidra	6. Aagantu Nidra		
6.	Ratrisvabhava-prabhava		7. Tamobhava Nidra		

SLEEP ACCORDING TO EACH DOSHAS

During the period of sleep, each individual will not experience the same type and same pattern of sleep. Each individual is different and can experience similar yet non-identical type of sleep. • Vata prakriti person will experience light, irregular and short duration of sleep. However, vata person would benefit with more rest. Symptoms of teeth grinding, sleepwalking and sleep talking are common. Dreams tend to be airy in nature, he will see that he's flying in air etc. Since *vata* types are light sleepers, they can easily wake during the night without being able to fall back asleep. *Vata*

- Dominant individuals often need 6-7 hours of sleep.
- *Pitta prakriti* person will experience sound sleep but also light. Generally, the amount of sleep is moderate, but they often forego sleep when preoccupied. Dreams tend to be wild, fiery, and vivid. Falling back asleep after waking up in the night is not troublesome. However, if the mind is overactive and stimulated, it will be difficult to fall back asleep. *Pitta* dominant individuals often need 7-8 hours of sleep to feel refresh.
- *Kapha prakriti* person will experience deep and sound sleep, heavy and stubborn. Meaning, they

are not easily disturbed or woken. They have a tendency to oversleep, even though they don't need to sleep for long periods. *Kapha* people need 8-9 hours of sleep.

PERIOD OF SLEEP

One feels sleepy during the night because of the calm and quiet environmental conditions and increase of *tamas*. During day, bright light and various noises have stimulating effects and keep a person awake and alert. Similarly, *sattva* quality predominates and hence the person remains active.

AGES	HOURS OF SLEEP REQUIRED	
Birth to 1 month	18-20 hrs.	
1-6 months	15-18 hrs.	
6 months – 1 year	14-16 hrs.	
1-2 yrs.	12-14 hrs.	
2-5 yrs.	10-12 hrs.	
5-16 yrs.	9-10 hrs.	
Adults	8 hrs.	
Old persons	4-6 hrs.	

Table 3: Requirement of sleep in *sattvika, rajasika* and *tamasika* persons are¹¹:

1 1		
SATTVIKA PERSON	RAJASIKA PERSON	TAMASIKA PERSON
4-6 hours of sleep	8 hours of sleep	10-12 hours of sleep

EFFECT OF STAYING AWAKE AT NIGHT (RAATRI-JAAGRAN

If a person keeps himself awake at night, it causes roughness in the body¹². Keeping awake at night increases *vata* and *pitta*. This causes complaints like-

- Constipation
- Weakness
- Giddiness
- Lack of concentration
- Hyperacidity
- Burning of eyes, hands and feet.

If, due to unavoidable reasons person has to keep awake at night, he should sleep during next morning, 4-5 hours before having food.

INDICATIONS FOR KEEPING AWAKE AT NIGHT:

- 1) Persons with *kapha* constitution and *kaphaja* disorders.
- 2) Obese persons
- 3) Persons who are poisoned
- 4) Persons taking diet rich in fat

INDICATIONS OF DAY SLEEP

Sleeping during the day time in the seasons other than summer is not advisable as it causes vitiation of *kapha* and *pitta*.

Table 4: Opinions of different Acharya's -

ACHARYA CHARAKA ¹³	ACHARYA SUSHRUTA ¹⁴	ACHARYA VAGBHATTA ¹⁵
 Sleeping during day time is indicated in - People exhausted by singing, study, alcoholic, sexual acts, elimination therapy, carrying heavy weight, walking long distance. 	 Sleeping during day time – It is permissible for 48 minutes in case of children, aged, emaciated by sexual intercourse, wasted due to chest wound, alcoholic addicts 	 Sleeping during day time is indicated in- Persons who are exhausted by long speaking, riding on animals or vehicles, walking long distances by enjoying excess drinks, sexual intercourse
• Those suffering from phthisis, wasting, thirst, diarrhea, colic pain, dyspnea, hiccup, insanity	• Those tired by riding, travelling in carriage or on foot and by hard work, those having not taken food	
Those who are too old, too young, weak and emaciated.	• Suffering from deficiency of fat, sweat, <i>kapha, rasa</i> and blood and having indigestion.	• Old, children, weak, emaciated, injured, thirsty, have pain, indigestion, are wounded and insane.
• Those who are injured by fall and assault, those who are exhausted by journey by a vehicle, vigil, anger, grief and fear.	• Day-sleep is also desirable for half the normal period in case of those having awoken in night.	-

CONTRA-INDICATIONS OF DAY SLEEP

Table 5: Opinions of various Acharya's-

ACHARYA CHARAKA ¹⁶	ACHARYA SUSHRUTA ¹⁷	ACHARYA VAGBHATTA ¹⁸
• Persons with excessive fat, people	• Day-sleep is contra-indicated in all	• Persons who are very much fatty and
who are addicted to taking	seasons except summers, in these	have kapha- predominancy
unctuous substances, those with	too, it is permissible for a muhurta	• Who are habituated to oleation
sleshmic constitution, those	(48minutes) in some cases	should not sleep during day time.
suffering from dushivisha	mention under indications of	
	sleep.	

DISEASES CAUSED DUE TO UNWHOLESOME SLEEP (AHITANIDRA

Table 6: Diseases which could result due to unwholesome sleep-

ACHARYA CHARAKA ¹⁹	ACHARYA SUSHRUTA ²⁰	ACHARYA VAGBHATTA ²¹
If person sleeps at day time then it	If person sleeps at day time, then it	If a person sleeps at day time, then it
leads to-	leads to-	leads to –
• serious type of jaundice (<i>halimaka</i>)	• People become victim of unrighteousness and aggravation of all <i>doshas</i> which give rise to disorders.	,,

•	headache, timidness, heaviness of the body, malaise, loss of digestive power	•	Disorders are- cough, dyspnea, coryza, heaviness in head, body- ache	•	Fever, giddiness, loss of intellect, obstruction of body channels, dyspepsia, swelling
•	<i>Hridyoplepa</i> , edema, anorexia, nausea, rhinitis, hemicrania, urticaria, eruption, abscess, pruritis, drowsiness, coughing, disease of throat, impairment of the memory and intelligence	•	Anorexia, fever and poor digestion.	•	Anorexia, nausea, running nose, hemicrania, itching, pain, rashes, eruptions
•	Obstruction of the circulating channels of the body, fever, weakness of sensory and motor organs and enhancement of toxic effects of artificial poisons.	•	Those who awake in night suffer from the same complications caused by <i>vata</i> and <i>pitta</i> .	•	Cough, lassitude, throat-disorders, progress of the action of poisons.

SUPPRESSION OF SLEEP

Table 7: Suppression of sleep causes various problems as described by various acharya's are as follows:

ACHARYA CHARAKA ²²	ACHARYA VAGBHATTA ²³
Yawning	Delusion
Body ache	Feeling of heaviness of the head and eyes
Drowsiness	Lassitude
Headache	Too much of yawning
Heaviness in the eyes	Squeezing pain all over the body.

INSOMNIA (ANIDRA

It is also known as sleeplessness, is a sleep disorder where people have trouble sleeping. They may have difficulty falling asleep or staying asleep as long as desired.

CAUSES OF INSOMNIA

Table 8: Causes of insomnia

ACHARYA CHARAKA ²⁴	ACHARYA SUSHRUTA ²⁵
• Elimination of <i>doshas</i> from the body and head through purgation and emesis	• Imbalance of <i>vata</i> and <i>pitta</i>
• Fear, anxiety, anger, smoke, physical exercise, bloodletting, fast, uncomfortable bed	doshas and mental stress are
• Predominance of sattva and suppression of tamas go a long way towards over-	the causes of insomnia.
coming the sleep-in excess.	
• Along with overwork, old age, diseases, especially these due to vitiation of <i>vata</i> like	
colic pain etc.	
Old age usually causes sleeplessness.	
• Some people suffer from sleeplessness by nature.	

FFECTS OF INSOMNIA²⁶

According to Acharya Vagbhatta in Ashtanga Hridaya sutrasthana, the effects of insomnia are:

1) Squeezing pain in the body parts

- 2) Heaviness of the head
- 3) Yawning
- 4) Lassitude
- 5) Exhaustion

- 6) Giddiness
- 7) Indigestion

- 8) Stupor
- 9) Diseases caused by excess of *vata*.

TREATMENT OF INSOMNIA

Table 9:

ACHARYA CHARAKA ²⁷	ACHARYA SUSHRUTA ²⁸	ACHARYA VAGBHATTA ²⁹
1. Oil massage and application of	1. Massage, head-oil, anointing and	1. Good sleep and mild massage are the
sandalwood paste to the head and face.	mildly pressing the body.	ideal treatment.
2. Unction, bath, intake of soup of	2. In diet, person should take sweet and	2. Person should indulge in the use of
domestic marshy and aquatic animals	unctuous food consisting of edibles	milk, wine, meat soup and curds, oil
	made of shali rice, wheat and rice flour	massage and mild squeezing of the body.
	processed with products of sugarcane	
	along with milk, meat-soup etc.	
3. shali rice with curd, milk and	3. In night, he should take draksha,	3. Bath, anointing the head, ears and
unctuous substance	sugar and sugarcane products.	eyes with nourishing oils, harbouring the
		feeling of satisfaction and resorting to
		things which are comforting to the mind
		as much as desired. These bring about
		the pleasure of good sleep.
4. Alcohol, psychic pleasure, smell of	4. Person should use bed. Seat and	
scents and hearing of sounds of one's	carriage and other things agreeable and	
own choice, rubbing the body by	soft.	
hands.		
5. Comfortable bed, home, proper time		
of sleep.		

GOOD AND BAD SLEEP

According to Acharya Charaka in *Sutrasthana*, the sleep caused by the nature of the night is the sleep par excellence; this is known as *bhutadhatri* (that nurses all the living beings). The one caused by *tamas* is the root cause of the entire sinful act. *Tamas* always causes excessive sleep. Thus, the individual is unable to perform the virtuous rites and so he subjects himself to sinful behavior. The *agantuki* type of sleep is caused as a complication of an incurable disease and as such it is in itself incurable. The remaining types are to be treated as diseases.

HYPERSOMNIA OR EXCESS OF SLEEP (ATINIDRA)

Hypersomnia is a neurological disorder of excessive time spent in sleeping or excessive sleepiness.

According to our classical texts, it leads to obesity and diseases due to increased *kapha dosha*, such as diabetes.

TREATMENT OF EXCESSIVE SLEEP³¹

According to Acharya Sushruta in *Sharirsthana*, in case of excessive sleep, person can be treated by evacuative measures particularly emesis, lightening, blood-letting and mind-agitating.

Other treatments:

- 1) Fasting
- 2) Induction of sweating
- Instillation of strong nasal drops or smelling of snuff
- 4) Application of strong eye ointment
- 5) Purgation

WAYS TO PROMOTE SLEEP

There are different ways to promote sleep which will help in maintenance of good health. These are *Pranayama*, meditation and *yoga*.

Meditation: Meditation is effective for all doshas and helps to set the mind, body, and soul in a calm and relaxed state. Meditation is a state of equilibrium between body and mind. Any form of meditation can be practiced. The simplest one is breath awareness meditation, where one focuses on his or her breath, inhale and exhale without letting the mind wander towards the thoughts that may arise. Focusing on the breath, instead of the day's events or concerns will help you relax. This type of meditation really helps to relax mind, body and soul and when these three are relaxed person feels fresh and relaxed and will experience good sleep which in turn promotes good health. Person should practice very regularly and at a fixed time in morning before sunrise and in the evening after sunset. Meditation should be practiced at a proper and fixed place. The person should forget distractions as far as possible when he sits for the practice of meditation.

Yoga: Yoga is the science of healthy and better living; physical, mental, moral, intellectual and spiritual. Yoga has now been applied as a routine practice for physical and mental fitness. Incorporate gentle restorative yoga poses. *Surya namaskara* is a routine that promotes relaxation and calms the mind, body, and soul.

CONCLUSION

On the basis of above description, it can be concluded that proper sleep at proper time is very essential for the growth and development of the body and mind. Sleep is very necessary for the wellbeing of a person's life. Sleep is a state when both the mind and the body are at rest. By emphasizing an appropriate routine and timings of the day's natural cycle, we can promote the sleep state, and, in turn, promote health.

REFERENCES

- Guyton A.C., Hall J.E. Text book of Medical physiology. 12/e. States of Brain Activity- Sleep, Brain Waves, Epilepsy, Psychoses-59. Elsevier Saunders. reprint 2012. p. 721.
- Trikamji Vaidya Yadavji. Charaka-Samhita of Agnivesha. Sutrasthana Ashtauninditiya adhyay-21/35. Varanasi Chaukhamba Surbharti Prakashan. reprint 2013. p. 118.
- Trikamji Vaidya Yadavji. editor Charaka-Samhita of Agnivesha. Sutrasthana Trisraishniya adhyay-11/35. Varanasi Chaukhamba Surbharti Prakashan. reprint 2013. p.74.
- Trikamji Vaidya Yadavji. editor Charaka-Samhita of Agnivesha. Sutrasthana Ashtauninditiya adhyay-21/36. Varanasi Chaukhamba Surbharti Prakashan. reprint 2013. p.118.
- Trikamji Vaidya Yadavji. editor Charaka-Samhita of Agnivesha. Sutrasthana Ashtauninditiya adhyay-21/38. Varanasi Chaukhamba Surbharti Prakashan. reprint 2013. p.118.
- Trikamji Vaidya Yadavji. editor Sushruta-Samhita of Sushruta. Sharirsthana Garbha Vyakaran adhyay-4/34. Varanasi Chaukhamba Surbharti Prakashan. Reprint 2012. P.358.
- Sharma R.K., Dash Bhagwan. Chakrapani Datta's Ayurveda Dipika. Charaka Samhita vol.-I. Sutrasthana 21/58. Edition-2011. Chowkhamba Sanskrit Series Office. Varanasi. p.385.
- Sharma P.V. Dalhana's Commentary. Sushruta Samhita vol. -II. Sharirsthana 4/33. Edition-reprint 2013. Chaukhambha Visvabharati. Varanasi. p.156.
- Rao B. Rama. Vagbhatta Sutrasthana. Ashtanga Sangraha vol.-I. Sutrasthana 9/68. Edition-2006. Chaukhambha Visvabharati. Varanasi. p.177.
- Ranade Subhash, Deshpande R.R., Bobade R.B. A Textbook of Swasthavritta. Reprint 2009. Chaukhamba Sanskrit Pratishthan. Delhi. p.40-41.
- Ranade Subhash, Deshpande R.R., Bobade R.B. A Textbook of Swasthavritta. Reprint 2009. Chaukhamba Sanskrit Pratishthan. Delhi. p.41.
- Sharma R.K., Dash Bhagwan. Chakrapani Datta's Ayurveda Dipika. Charaka Samhita vol.-I. Sutrasthana 21/50. Edition-2012. Chowkhamba Sanskrit Series Office. Varanasi. p.384.
- 13. Sharma R.K., Dash Bhagwan. Chakrapani Datta's Ayurveda Dipika. Charaka Samhita vol.-I.

Sutrasthana 21/39-43. Edition-2012. Chowkhamba Sanskrit Series Office. Varanasi. p.382.

- Sharma P.V. Dalhana's Commentary. Sushruta Samhita vol.-II. Sharirshtana 4/38. Edition-reprint 2013. Chaukhambha Visvabharati. Varanasi. p.158.
- Rao B. Rama. Vagbhatta Sutrasthana. Ashtanga Sangraha vol.-I. Sutrasthana 9/46-47. Edition-2006. Chaukhambha Visvabharati. Varanasi. p.174.
- Sharma R.K., Dash Bhagwan. Chakrapani Datta's Ayurveda Dipika. Charaka Samhita vol.-I. Sutrasthana 21/44-45. Edition-2012. Chowkhamba Sanskrit Series Office. Varanasi. p.383.
- Sharma P.V. Dalhana's Commentary. Sushruta Samhita vol.-II. Sharirshtana 4/38. Edition-reprint 2013. Chaukhambha Visvabharati. Varanasi. p.158.
- Rao B. Rama. Vagbhatta Sutrasthana. Ashtanga Sangraha vol.-I. Sutrasthana 9/48. Edition-2006. Chaukhambha Visvabharati. Varanasi. p.174.
- Sharma R.K., Dash Bhagwan. Chakrapani Datta's Ayurveda Dipika. Charaka Samhita vol.-I. Sutrasthana 21/44-49. Edition-2012. Chowkhamba Sanskrit Series Office. Varanasi. p.383.
- Sharma P.V. Dalhana's Commentary. Sushruta Samhita vol.-II. Sharirshtana 4/38. Edition-reprint 2013. Chaukhambha Visvabharati. Varanasi. p.158.
- Rao B. Rama. Vagbhatta Sutrasthana. Ashtanga Sangraha vol.-I. Sutrasthana 9/49-51. Edition-2006. Chaukhambha Visvabharati. Varanasi. p.174-175.
- Sharma R.K., Dash Bhagwan. Chakrapani Datta's Ayurveda Dipika. Charaka Samhita vol.-I. Sutrasthana 7/23. Edition-2012. Chowkhamba Sanskrit Series Office. Varanasi. p.150.
- Murthy K.R. Srikantha. Vagbhatta's Ashtanga Hridayam vol.I. Sutrasthana 4/12. Edition-2013. Chowkhamba Krishnadas Academy. Varanasi. p.47.
- Sharma R.K., Dash Bhagwan. Chakrapani Datta's Ayurveda Dipika. Charaka Samhita vol. I. Sutrasthana 21/55-57. Edition- 2012. Chowkhamba Sanskrit Series Office. Varanasi. p. 385.
- Sharma P.V. Dalhana's Commentary. Sushruta Samhita vol.-II. Sharirshtana 4/42. Edition-reprint 2013. Chaukhambha Visvabharati. Varanasi. p.159.
- Murthy K.R. Srikantha. Vagbhatta's Ashtanga Hridayam vol.I. Sutrasthana 7/64. Edition-2013. Chowkhamba Krishnadas Academy. Varanasi. p.121.
- 27. Sharma R.K., Dash Bhagwan. Chakrapani Datta's Ayurveda Dipika. Charak Samhita vol.I. Sutrasthana

21/52-54. Edition 2012. Chowkhamba Sanskrit Series Office. Varanasi. p.384.

- Sharma P.V. Dalhana's Commentary. Sushruta Samhita vol.-II. Sharirshtana 4/43-46. Edition-reprint 2013. Chaukhambha Visvabharati. Varanasi. p.159.
- Murthy K.R. Srikantha. Vagbhatta's Ashtanga Hridayam vol.I. Sutrasthana 7/66-68. Edition 2013. Chowkhamba Krishnadas Academy. Varanasi. p.121.
- Sharma R.K., Dash Bhagwan. Chakrapani Datta's Ayurveda Dipika. Charak Samhita vol.I. Sutrasthana 21/59. Edition 2012. Chowkhamba Sanskrit Series Office. Varanasi. p.386.
- Sharma P.V. Dalhana's Commentary. Sushruta Samhita vol.-II. Sharirshtana 4/47. Edition-reprint 2013. Chaukhambha Visvabharati. Varanasi. p.159.

Source of Support: Nil

Conflict Of Interest: None Declared

How to cite this URL: Pooja Sabharwal et al: A Scientific Ayurvedic Exploration Of Concept Of Sleep (Nidra). International Ayurvedic Medical Journal {online} 2018 {cited June, 2018} Available from:

http://www.iamj.in/posts/images/upload/1295_1302.pdf