<This is a direct translation of a Japanese press release issued on March 25, 2014>

The Osaka Study: An epidemiological survey showing that dry eye disease lowers work productivity, affects quality of life and correlates with metabolic syndrome

March 25, 2014--- The Dry Eye Society - a group based in Tokyo, Japan and headed by Dr. Kazuo Tsubota - and Santen Pharmaceutical Co., Ltd. of Osaka, Japan announced the results of a large-scale survey called the Osaka Study that examined the effects of dry eye disease (DED).

●Dry eye disease : office workers are at high risk

Dry eye disease (DED)occurs when tiny abrasions to parts of the surface of the eye called the cornea and the conjunctiva develop due to an imbalance in tear production quality and quantity. The condition results in various unpleasant symptoms such as dryness, a gritty sensation in the eye and visual fatigue.
A number of causes are responsible for the imbalance in tear production that characterizes DED, with environmental factors being the most prevalent. One factor contributing greatly to the rise in DED is a modern-day lifestyle where prolonged use of computers and smartphones has become the norm. This is especially true of office workers who are increasingly overworking their eyes on the job. People who operate digital devices on a regular basis tend to suffer from tired eyes because they blink less frequently. This dries the surface of the eye and triggers worrisome visual disorders such as DED.

●Evidence that DED affects productivity

In 2011, Santen Pharmaceutical Co., Ltd. (Osaka, Japan) teamed up with the Dry Eye Society, an organization headed by Dr. Kazuo Tsubota, to conduct a survey called the Osaka Study, which attempted to assess the status of DED among office workers. The study discovered a range of intriguing findings such as:

- 60% of office workers were found to actually or potentially suffer from DED
- business productivity is lower among those with DED
- DED impacts sleep quality and levels of happiness
- metabolic syndrome is correlated with DED

Last autumn, prominent medical journals began to publish the results of the Osaka Study in ensuing order. A list of such publications is provided below.

●Dry Eye Management: a new business strategy

Until now, the conventional wisdom was that DED is exactly as its name suggests: dryness of the eyes from visual fatigue. However, the Osaka Study showed the effects are much more consequential than previously believed. Investigators calculate that DED is responsible for about three annual working days lost for the average Japanese worker. This is equivalent to an annual loss of about 487,000 yen in sales, and an annual loss of about 93,000 yen in income per capita for the target business. As such, the Osaka Study thinks both employers and employees can benefit from adopting Dry Eye Management, a concept that involves reassessing digital device usage, office environment environments and work procedures..

The Osaka Study

Dry Eye Society and Santen conducted this large-scale survey to examine the effects of DED on office workers. The study not only looked at the prevalence of DED, but also employed a questionnaire to collect data on lifestyle-related risk factors. Investigators of the project consisted solely of physicians specializing in DED. The project was named after the city of Osaka, where Santen are located.

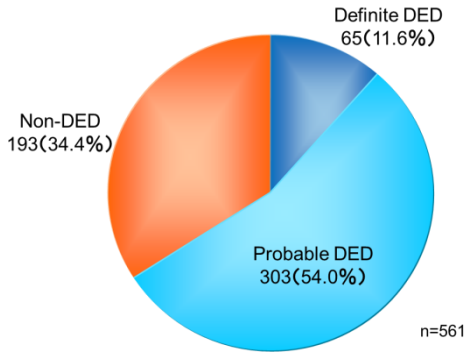
- Study period: 4 days from Aug. 29 to Sept. 1, 2011
- Subject pool: 672 Santen employees
- Eligible participants: 561
- Physiological test: Slit-lamp exam to examine the eye surface and tear quality
- Questionnaire contents:
  - Lifestyle habits
  - 12 items on dry eye
  - Presence or absence of history of dry eye diagnosis
  - VDT working hours
  - Systemic illness (high pressure, diabetes), oral medicine
  - Smoker or non-smoker
  - Non-user or user of contact lenses, and lens type
  - The Subjective Happiness Scale
  - The Pittsburgh Sleep Quality Index
  - International Physical Activity

(Reference)

Primary epidemiological findings

1. Approximately 65% of office workers actually or potentially suffer from DED

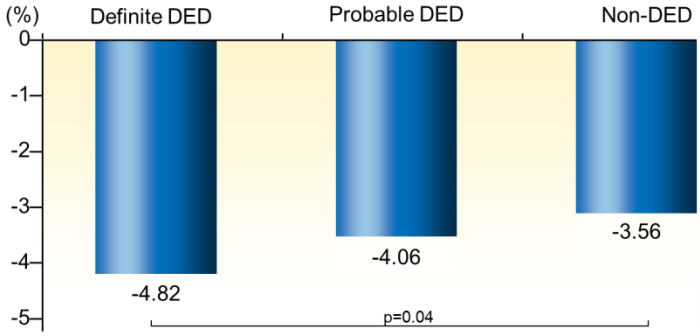
Out of a subject pool of 672 employees working at Santen Corporate Headquarters, 561 were eligible for the study. As a result of performing an ophthalmic exam, 368 subjects (65%) were diagnosed as actually or potentially suffering from DED.



	Definite DED	Probable DED	Non-DED	Total
Man	30 (8.0%)	195 (52.1%)	149 (39.8%)	374
Woman	35 (18.7%)	108 (57.8%)	44 (23.5%)	187
Overall	65 (11.6%)	303 (54.0%)	193 (34.4%)	561

2. DED is responsible for reduced productivity

Using a quantitative research questionnaire, the Osaka Study measured the effects of DED on work productivity. Investigators detected a significant loss of productivity among subjects actually diagnosed with DED as compared to those who were not. The study estimates that DED is responsible for about three annual working days lost for the average Japanese worker. This is equivalent to an annual loss of about 487,000 yen in sales, and an annual loss of about 93,000 yen in income per capita for the target business.



Depression as well as hay fever and other allergies are known to decrease productivity among those healthy enough to attend work. Accordingly, the Osaka Study showed that DED affects work performance to about the same degree as migraines.

Disorder	Prevalence	Average productivity decline
Depression	13.9%	7.6%
Arthritis	19.7%	5.9%
Chronic lower back pain	21.3%	5.5%
Asthma	6.8%	5.2%
Gastroesophageal reflux disease	15.2%	5.2%
Migraines	12.0%	4.9%
DED (Osaka Study data)	11.6%	4.8%
Allergies, sinus problems	59.8%	4.1%

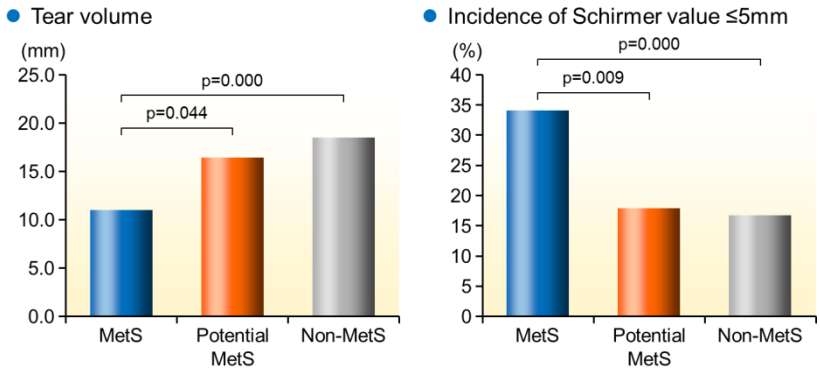
Source: Hemp, P. (2004). Presenteeism: At Work—But Out of It. *Harvard Business Review*
Retrieved from http://hbr.org/2004/10/presenteeism-at-work-but-out-of-it/ar/1
(n=1,600)

3. Dry eye lowers the quality of both sleep and life

The Osaka Study rated subjects on a global four-item measure called the Subjective Happiness Scale. The results revealed a statistically significant positive correlation between dry eye symptoms and happiness ratings. In other words, subjects with worse dry eye symptoms tended to be less happy.
The investigators also rated subjects with a global measure called the Pittsburgh Sleep Quality Index and found that sleep quality was lower among subjects with dry eye.

4. Less tear production linked to metabolic syndrome

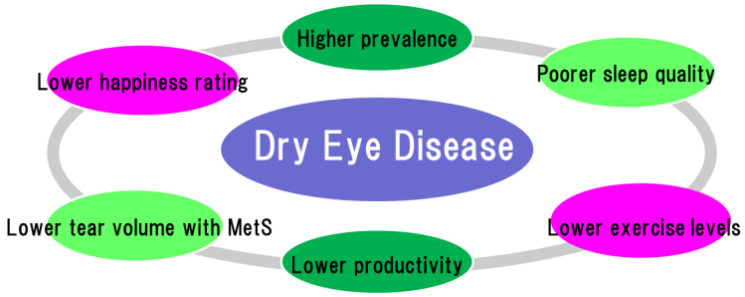
The Osaka Study discovered significantly lower tear volumes in subjects aged forty and above with metabolic syndrome (MetS).
MetS is the name for a group of risk factors for diabetes, hypertension and other lifestyle diseases. Since the condition is known to adversely impact productivity, more local governments and businesses in Japan are implementing measures to combat MetS.



The connection with MetS is also reinforced by the finding that DED subjects were found to exercise less.

5. Conclusion: DED has a significant impact on QOL

The Osaka Study concluded that more than half of all office workers suffer from DED and that the condition is associated with metabolic syndrome, lower happiness ratings and poorer sleep quality. Under such circumstances, workplaces will surely benefit from proactively adopting the concept of Dry Eye Management.



The List of Osaka Study papers

1	Uchino M, Yokoi N, Uchino Y, Dogru M, Kawashima M, Komuro A, Sonomura Y, Kato H, Kinoshita S, Schaumberg DA, Tsubota K. Prevalence of dry eye disease and its risk factors in visual display terminal users: the Osaka Study. *American Journal of Ophthalmology* 2013 Oct;156(4):759-66.
2	Uchino M, Uchino Y, Dogru M, Kawashima M, Yokoi N, Komuro A, Sonomura Y, Kato H, Kinoshita S, Schaumberg DA, Tsubota K. Dry eye disease and work productivity loss in visual display terminal users: the Osaka Study. *American Journal of Ophthalmology* 2014 Feb;157(2):294-300
3	Kawashima M, Uchino M, Yokoi N, Dogru M, Uchino Y, Komuro A, Sonomura Y, Kato H, Kinoshita S, Tsubota K. Decreased tear volume in patients with metabolic syndrome: the Osaka Study. *British Journal of Ophthalmology* 2014 Mar;98(3):418-20.
4	Uchino Y, Uchino M, Yokoi N, Dogru M, Kawashima M, Okada N, Inaba T, Tamaki S, Komuro A, Sonomura Y, Kato H, Argüeso P, Kinoshita S, Tsubota K. Alternation of Tear MU5AC in office workers using visual display terminals: the Osaka Study. *JAMA Ophthalmology* (in press)

Papers prepared by the Osaka Study are also scheduled to appear in five other international medical journals.