

Wearing Alcovista glasses impact on walking in young adults.

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Written to be understandable for all public.

Walking is one of the most frequent movements in our daily life. It is so important that we don't even have to think about it when we are walking, and we are able to do something else at the same time. But, in order to move in an appropriate way in our environment, it is necessary to prevent actions and react to a disturbance (pavement, other people). This process makes different senses systems (vision, vestibular system, proprioception) and neuro-motors work together in order to detect those external disturbances and adapt movement consequently.

A big alcohol consumption, which makes a deficient coordination of movements, decrease of reflects and attention, will show a significant modification of walking, the balance and a lack of adaptation capacity. What is less obvious is a moderate consumption of alcohol as it affects walking and balance in a most moderate way even without real external alterations. To go in details, under the effects of alcohol walking tends to be slower and inconsistent (more variable), with shorter path with sometimes a big gap between both feet.

In prevention and pedagogical actions participants are often asked to experiment the influence of alcohol on the achievement of simple goals as walking on a line, stand in one leg or take an object. In respect to the simulation glasses, it brings the user into a similar situation as real drunkenness with behaviours associated to it as loss of balance, vision distortion and bigger reaction times.

In the initial training for Master 1 students specialized in Human Biomechanics, Ergonomic and Clinic research (UFR Sciences et Techniques des Activités Physiques et Sportives de Reims), we have built a simple protocol in order to evaluate the influence of the simulation glasses on walking in young adults. We have made the theory that similar changes to the ones brought by alcohol consumption will be observed.

Methods

25 students (7 women, 18 men), from 20 to 30 years old (ages: 23.2 ± 2.6 years; height: 174.7 ± 9.1 cm) has participated in this protocol realised in a tutorial session.

It has been asked to each of them to walk at a spontaneous speed, first in standard conditions (without glasses) and then wearing the alcohol simulation glasses. The selected glasses were the « High Level » simulation glasses Alcovista® (Preventrika France, Paris, France). Via a prismatic distortion filter and a reduced vision field, those glasses simulate the physical alterations provoked by an alcohol level between 0.8 and 1.5 gr/L, so a consumption of 4 to 8 glasses of alcohol. The students only discovered the glasses effects in the recording session walking with glasses and without previous trail.

Walking has been recorded in a Zeno treadmill (ProtoKinetics LLC, Havertown, USA ; sold in France by SAMMed). The treadmill is equipped with thousands of sensors measuring the pressure, which allows to record the feet position and the pressure made on the floor in order to evaluate the time and space parameters of walking (length of the path, rhythm, time spent being on both feet and in one foot etc....)

and access to information regarding the path roll out. The system presented an active length of 4.27meters and an active width of 0.61meters. This recording zone is a light path lane (see in the video). The people started about 1.5meters before the mat and finished 1.5meters after in order not to record acceleration and deceleration phases. In order to get enough pace for analysis, it has been recorded between 3 and 5 times on the mat depending on the size of the people and the success of walking on the treadmill with the glasses. It is noted that wider treadmills are available (122cm wide) and would have been more adequate for this kind of protocol. The data has been processed and analysed with PKMAS software (version 5.09). A Wilcoxon test for matched has been made for statistic identification of the changes in the walking parameters.

Results

When they are not wearing the glasses, the students had shown very predictable walking characteristics as in adult population, as much as in medium parameters. Except for the speed of walking and length of the step, which are directly influenced by the length of the legs, all of them showed comparable parameters (see low group standard deviation).

In alcohol simulation conditions, wearing Alcovista® glasses people walked significantly slower, caused by a joint reduction of the pace and length of the step, increased their width of step and spent more time in double support (part of the walk where we are in both feet at the same time). Obviously, they have not responded systematically the same way, some students where more affected than others. We can appreciate it in the standard deviation of the group, it has double from the normal condition. For example, in 25 persons, 14 has decrease their speed more than 10%, 5 has decreased between 5 and 10%, 5 shown up less than 5% of speed variation and 1 has walked 7% faster.

In terms of variability, this one has increased with the glasses for all the parameters, for space and time. Also, the impact was different depending on the person, but all increased the variability of their walk.

Table 1. Comparison of the space and time parameters with and without glasses. The significant differences will appear in red colour.

	Normal Walk		With Alcovista Glasses		Level p.
	Average	Standard deviation	Average	Standard deviation	Sign. <0.05
<u>Average parameters</u>					
Speed (cm/s)	141.29	12.19	121.85	25.45	0.0001
Length of step (cm)	73.78	5.37	67.00	9.05	0.0001
Pace (step/min)	114.35	5.89	108.38	12.11	0.0038
Walk Ratio (cm/(step/min))	0.65	0.06	0.62	0.08	0.0094
Width of step (cm)	8.58	3.24	9.48	5.15	0.0173
Support phase (% cycle)	60.98	1.00	61.57	1.78	0.0149
Single support (% cycle)	39.17	0.98	38.68	1.92	0.0875
Double support (% cycle)	21.65	1.98	22.84	3.60	0.0303
<u>Variability parameters</u>					

Speed - CV	3.93	1.46	6.68	4.38	0.0008
Length of step - CV	3.13	0.90	5.19	2.62	0.0003
Width of step – Std deviation	2.10	0.65	4.52	2.19	0.0000
Support phase - CV	1.58	0.33	2.94	2.03	0.0000
Single support - CV	2.53	0.47	4.59	3.27	0.0002
Double support - CV	5.25	1.37	7.31	3.42	0.0011
Gait Variability Index	100.33	4.60	115.82	13.80	0.0003

Conclusion

On one hand, in the group statistics (how parameters are changing with glasses) is showing that walking has been modified in the same manner as we could observe it with alcohol consumption. Of course, it is not possible to say if these modifications will remain as big with alcohol level 0.8 and 1.5g/l. Nevertheless, if we take the medium decrease of 11% of speed observed in our student group (-14%), it is comparable to the decrease of 11% observed in the study of Demura and Uchiyama (2008), 20 minutes after alcohol consumption for alcohol estimated rate of 1.3 et 1.7 g/l, in young men adults.

On the other hand, if all these people haven't been affected on a similar way, it is the same when it is related to alcohol as some people hold drinking better than others. No information regarding the regular alcohol consumption has been collected in the aim of this protocol with pedagogical goals, but it will be interesting to know if the people who have shown less modifications are in general the heavy drinkers.

To recap, Alcovista® glasses appears to respond perfectly as a pedagogical and prevention alternative.