Global Journal of Human Resource Management
Vol.8, No.4, pp.14-23, November 2020
Published by ***ECRTD-UK***
Print ISSN: 2053-5686(Print), Online ISSN: 2053-5694(Online)

AN EVALUATION OF OCCUPATIONAL SAFETY AND HEALTH MANAGEMENT IN THE APPAREL INDUSTRIES OF BANGLADESH

Rehnuma Sultana Khan
Assistant Professor
Department of Business Administration
Southern University Bangladesh
rehnukhan@yahoo.com

ABSTRACT: *Occupational Safety and Health (S&H) is one of the most critical functions of the Apparel Industries of Bangladesh. This study had endeavored to evaluate the existing condition of S&H practices in Apparel Industries of Bangladesh by reviewing the opinion of 120 workers of 12 Apparel Industries located in Chattogram, Bangladesh. The primary data was collected through a close-end questionnaire survey. It was found in the study that the sample apparel factories are very successful in installing a sufficient number of fire safety equipment and making the first aid box available. However, the results also show the high regularly of S & H training. Hence, the factories were found weak in maintaining fire safety equipment regularly and there is a lack of adequate fire exit as well. The study suggested some specific policy recommendations to overcome the limitations. Bangladeshi apparel factories are improving the condition of S&H. Hence, a research paper like this can encourage an intensive discussion on the necessity of improving the S&H practices in this economically significant sector.*

KEYWORDS: occupational safety and health, readymade garments, apparel industries, compliance, Bangladesh

INTRODUCTION

Bangladesh's apparel sector has achieved unprecedented economic escalation and has become the fastest-growing manufacturing industry (Rahman & Hossain, 2010). Bangladeshi apparel industry has earned a global reputation and become the largest source of foreign exchange earnings. Many human resources are employed in this sector (Siddiqi, 2005) and it has currently been the world's second-largest garments exporter. Despite its glorious success, this sector had encountered many industrial catastrophes that caused thousands of workers' death. According to Huda (2016), these disasters were caused due to negligence in ensuring occupational safety and health (OSH) management. The garment workers of Bangladesh may be the most deprived labor force in the world (Amin, 2009). They are ill-paid and cannot stand with their rights as they are not financially and socially empowered. Many times, the workers are forced to work in unsafe industrial plants.
The recent structural collapse of Rana Plaza and fire at Tazreen Fashions have drawn the world's attention to it as it caused the most massive killing of workers in the world's industrial history. The world community has reacted to these events with an embargo over the Generalized System of Preference (USA-GSP) privilege of this sector and created pressure to have complained about

the health and safety issues. The European Union (EU), which is the largest destination of the country's exports, about USD 12 billion through GSP facilities, has threatened Bangladesh to take appropriate measures to improve workplace safety. At present, there are about 4,560Garments Industries in Bangladesh which have created employment opportunities for 3.6 million people, but only a few factories here maintain international standards, and many of them do not implement any workplace health and safety measures (The Financial Express,2008). Many of the influential direct and indirect stakeholders of the health and safety (H & S) compliance are coming up with high-sounding ideas but failing to hit the bottom line to minimize the industrial incidences. As a result, S&H issues remain in pages of journals, newspapers, and most commonly in the TV talk shows. The study tried to take account of the current state of the S&H conditions of some selected garments factories by taking the evidences from the workers' key stakeholders.

RATIONALE OF THE STUDY

After the horrific catastrophe of Rana Plaza, many stakeholders in the apparel sector have become pessimistic about this field's prospects. Many of the significant apparel buyers had threatened the Bangladeshi apparel entrepreneurs for being negligent in maintaining S&H compliance in their factories. The GSP privilege granted by the US Government was withdrawn. For these unexpected and unprecedented deaths of many workers at an unsafe workplace, human rights groups and civil societies worldwide denounce Bangladesh. The world buyer communities are intensively looking for new apparel sources urgently after this worst industrial accident in the world history. The collapse of the Rana Plaza factory killed about 1135 employees in a few hours. According to a research by Action Aid Bangladesh, 74% of the Rana Plaza victims are unemployed, 76% are still under treatment, 23.76% are suffering from mental trauma, 66%are financially insolvent to live a dignified life, and 1058 injured workers are physically traumatized and incapable of working (The Daily Star 2014). In the face of increasing foreign competition, this sector's management treats inhumanly with the workers and exploits them to boost their profit margins and keep their industry competitive (Kumar, 2006).

According to the recent statistics of Transparency International Bangladesh (TIB) 102 initiatives were taken by different stakeholders of the apparel sector but faced lots of challenges concerning good governance issues (The Daily Star, 2014).However, among those initiatives, 31% had seen the light of implementation, 60% of initiatives made partial success, and unfortunately, 9%of those projects remained unaddressed. The families of the dead and injured in the Rana Plaza tragedy lead a life of misery as the owners of garment factories and global brands have failed to rehabilitate them. It is clear from the above discussions that the future of this industry is in severe crisis. This sector's stakeholders must recognize the possible adversity and develop a practical S&H compliance model to ensure safety in the workplace and save the industry. The study will try to justify S&H initiatives' necessity and, most significantly, the participation of workers and staff in S&H enforcement programs through awareness empowerment.

LITERATURE REVIEW

Occupational health and safety doctrines are must be practiced universally, and the intervention mainly depends on the magnitude of the organizational operations, the degree of hazards, intensity of the activities, the physical characteristics of the organization, products, or services, and the adequacy of its existing arrangements (Zin & Ismail, 2012). The notion of workplace safety should be a strategic management issue for an organization that will involve its members to collectively develop a self-directed approach of the S&H model for ensuring a standard occupational safety and health management system (Rahimi, 1995). However, transformational leadership should be developed among management employees to value workplace safety issues (Grubbs, 1999). Every organization should manage S&H with due diligence to maintain S&H standards, control risks effectively, and prevent workplace accidents (Okoye, Ezeokonkwo & Ezeokoli, 2016). Dedication of top management is the cornerstone of all effective S&H programs. Every responsible company must contribute to protecting its workers by taking comprehensive programs to recognize and remove hazard & risk factors and ultimately reduce accidents at the workplace (Ulinfun, 2002).

A good safety program must identify hazards and eliminate the organization's potential risk (Yapp & Fairman, 2006). The practice of workplace safety should be the primary concern of every manufacturing industry, and all responsible companies should endeavor to address health hazards that endanger the life or health of employees (Vincoli, 1993). S&H programs should be the first priority of every business to reduce workplace accidents, frequent absenteeism for illness, and minimizing higher health costs (Hammer, 2016). S&H schemes should be applied correctly and must reduce the number of injuries and accident compensation costs (Healy, 2016). The top management should emphasize voluntary S&H programs, and they should be incredibly involved and committed to implementing the safety program in the organizations (Hansen & Tickner, 2007). However, some companies endanger the safety of their workers by being negligent in S&H issues (Gray, 2009).

According to Ford (2000), sufficient pressure from government agencies and insurance companies can compel the organizations to ensure a safe work environment. Hence, early measures on S&H incidents and the implementation of S&H practices through participation among all, the manufacturing companies' stakeholders may promote a culture of safety at the workplace (Goetsch, 1996). Such S&H culture reduces the causes of accidents and injuries and builds a cohesive relationship between top management and workers that fosters S&H interventions (Kunyk, 2016). S&H principles should be the fundamental value of an organization to address health and safety issues duly to protect the workers' rights and reduce grievances (Friis, 2014). S&H programs should endeavor to develop a positive attitude of people working in different organizations to identify health hazards, prevent injuries, and minimize risk (Saari, 1992).

Occupational S&H culture in an organization could be promoted by developing a strong belief and behavior towards achieving its goal (Yorio, & Wachter, 2014; Petersen, 1996). A robust voluntary

association should be developed between management and workers to foster such culture and ensure safety (Honkasalo, 2000). To ensure S&H in a manufacturing organization, following practices must be regularized by the organizations. Ventilation & temperature should be well maintained (Akbar-Khanzadeh & Ramsey, 1987). Personal Protective Equipment (PPE) should be provided in sufficient quantity (Ulutasdemir et al., 2015), and fire safety equipment should be made available adequately (Zeng, Tam & Tam, 2008). However, fire safety equipment should be maintained regularly (Mwombeki, 2005), and emergency exits should be constructed accordingly (Zile, 2018).

Adequate lighting facilities should be made available, and mechanical noise should be managed effectively (Goelzer, Hansen & Sehrndt, 2001). Sufficient washing facilities should be made available along with a sufficient number of toilets and urinals (Danso, 2010).Pure cold water should be supplied adequately during the summer season (Akhter et al., 2010). Medical facilities have to be provided to the workers adequately, and physicians should be made available on a full-time basis. Hence, full-time nurses should be employed by organizations (Shikdar & Sawaqed, 2003). Fully equipped first aid boxes should be near &available on every shop floor for emergency medical response, and the first aid box should be maintained regularly (Lingard, 2002; Plunkett, 1994). S & H training is provided to all the members of the organization regularly (Huda, Shakil& Islam, 2018;Fletcher, 2001), and safety workers should regularly report and audit the S&H process, performance, incidents, accidents, injury and illness (Ulinfun, 2002; Mansdorf, 1999).

Bangladesh is one of the world's leading apparel exporters and has earned the same confidence in terms of quality, price, and delivery. This industry has been grown up rapidly since 1977, and the journey has not stopped even for a while (Islam, Rakib & Adnan, 2016).At present, there are about 4,560apparel industries in Bangladesh, which have created employment opportunities for 3.6 million people (Hasan, 2018). The above information and statistics project that this industry started from mini and contributing to the national economy the most. Despite this economically valuable sector's glorious success, the working conditions concerning S&H faced lots of challenges (Huda et al., 2018). Chronic labor unrest prevails in this sector is due to the negligence in establishing labor rights and very hazardous work environments (Mahmud, 2009).

The entrepreneurs of the apparel industries of Bangladesh are expecting high productivity and profitability but are found very negligent in ensuring S&H for the workers (Huda, 2016). They still have failed to understand workers' importance in developing this sector (Tamanna, 2010). Therefore, the government agencies' strict regulatory measures and monitoring could help overcome the S&H problem in the apparel manufacturing industries of Bangladesh (Alam et al., 2004). Research on the S&H in apparel industries is rare, and a minimal study has been made on Bangladesh's perspective. However, this need for study constitutes a research gap and has inspired the author to conduct extensive quantitative research on S&H assessment, especially on the Bangladeshi apparel industry. This study will minimize that gap by exhibiting the present picture of S&H practices in Bangladesh's apparel industries.

METHODOLOGY OF THE STUDY

This study is a joint attempt of a survey-based research and desk study. The survey tried to gather the essential information and data through a standardized questionnaire prepared aligned with the research objectives. The data were collected from 12 apparel industries located in Chattogram, Bangladesh. Workers of the sample industries were interviewed to collect quantitative data on the current condition of S&H issues. Hence, a focus group discussion (FGD) was conducted with five senior human resources managers of selected apparel industries to justify the study's outcome. The discussions of FGD were recorded in an audio recorder. A total of 120 workers of the 12 sample plants were selected for the survey and a close-end questionnaire were used for data collection. A 5-point Likert scale was used in the questionnaire to take the degree of response. The respondents were generally senior female operators with a minimum of five years of working experience in the apparel industry. The questionnaire contained 16 questions that represent variables of occupational S&H practices (Table 1). Findings were drawn from both primary and secondary data. The survey was carried out from October 30th 2019 to January 26th 2020.

6.0 Findings and Discussion

Table 1:

	Variable of S & H Compliance	***Mean Value***	***Standard Deviation***	***t***	***Sig***
1	Ventilation & temperature is well maintained.	3.15	1.42	7.18	0.02
2	PPE is provided in sufficient quantity	3.04	1.35	7.13	0.00
3	Fire safety equipment are sufficient in number	4.09	1.46	6.73	0.00
4	Fire safety equipment is maintained properly	2.85	1.42	6.41	0.06
5	The emergency exit is sufficient in number	2.96	1.38	6.50	0.07
6	Adequate lighting facility is available	3.59	1.45	7.80	0.05
7	Noise management is effective	2.37	1.37	6.59	0.08
8	Sufficient number washing facility is available	3.70	1.39	6.91	0.05
9	A sufficient number of toilets are available	3.43	1.48	6.45	0.03
10	Water coolers are available in adequate quantity	2.17	1.42	7.14	0.02
11	Medical facilities for the workers are sufficient	3.11	1.33	7.54	0.05
12	The doctor is available on a fulltime basis	2.03	1.31	6.16	0.09
13	Nurses are available on a fulltime basis	3.26	1.28	6.44	0.03
14	A sufficient number of first aid box are available on every floor	4.32	1.16	7.81	0.00
15	First aid box is regularly maintained	3.29	1.26	7.23	0.04
16	S & H training is provided regularly	3.78	1.37	6.66	0.00

Source:

After statistically examining the data given in table 1,the degree of S&H compliance is briefly described to understand and predict the actual picture of S&H compliance practice in the sample apparel factories. On the issue of ventilation & temperature, it is well maintained; the mean value is 3.15, SD 1.42,t value7.18, and sig 0.02. The data depicts that the sample apparel factories

somewhat successfully maintained the factory's ventilation & temperature. Regarding PPE's sufficiency (mean value 3.04, SD 1.35, t vale 7.13, and sig 0.00.) provided to the workers, the sample factories are found to be partially successful. Most workers have agreed that fire safety equipment is sufficiently available in the factory as the mean value is very high (4.09). However, the SD is 1.46, t value 6.73, and it is highly significant 0.00. Hence, it is clear from the study that the sample apparel factories are keeping an adequate number of fire safety equipment for emergency use.

On the other hand, the workers are a little skeptical regarding the regular maintenance of the fire safety equipment as the mean value is very low (2.85). The SD value is 1.42, t value 6.41, and the level of significance is 0.06. The data gives a clear picture of the irregularity of the maintenance of fire safety equipment. It is very alarming that the sample factories have a good number of fire safety equipment but remains without timely maintenance. Such finding is also visible in the research made by (Huda, 2016).

On the aspect of emergency exit or evacuation, the mean value is 2.96, SD 1.38t value6.50, and sig 0.07. Hence, another critical determinant of occupational S&H management has remained unnoticed in the sample apparel factories. Concerning the availability of adequate lighting facilities to workers, the mean value was found 3.59, followed by SD 1.45, t value 7.80, and sig 0.05. The data projects the success of the sample apparel factories in maintaining better lighting on the shop floors. However, the study shows a negative result about noise management as the mean value was found low (mean 2.37, SD1.37,t value 6.59, and sig 0.08). On the issue of sufficiency of washing facilities, the result is very impressive as a result is (mean value 3.70, SD 1.39, t value 6.91 and sig 0.05) statistically significant. Hence, the sufficiency of toilets had followed the previous result as the statistical values are also highly significant i.e., Mean value 3.43, SD 1.48, t value 6.45, and sig 0.03.

The result shows the inadequacy of water coolers in the factory building as the mean value is relatively insignificant 2.17(SD1.42, t value 7.14and sig 0.02). The workers also reported that some of the water coolers are out of order for a long time. According to the survey result, medical facilities in the sample industries are highly accessible. The mean value of this variable is 3.11, SD1.33, t value 7.54, and sig 0.05. Hence, the presence of a full-time doctor at the factory clinic is seldom as the findings lack statistical significance (mean 2.03, SD 1.31, t value 6.16, and sig 0.09). Though there is a lacking with regard to the presence of Doctors in the factory, full-time nurses were made available in the factory clinic (mean 3.26, SD1.28, t value6.44 and sig 0.03). There are sufficient numbers of first aid boxes available on every floor (mean 4.32, SD 1.16, t value 7.81and sig 0.00), and as per the result, the first aid boxes are regularly maintained by the organization (mean 3.29, SD 1.26, t value 7.23 and sig 0.04). However, S & H training is provided regularly to the workers (mean 3.78, SD 1.37, t value 6.66 and sig 0.00), and the workers are happy with the standard of the training.

Policy Prescription and Managerial Implication

The sample factories are found weak in maintaining the fire safety equipment properly and effectively managing industrial noise. The compliance managers are suggested to appoint a safety petrol officer to report noncompliance. However, the top management must install an adequate quantity of water coolers on every shop floor of the factories. They should build sufficient emergency exit according to Bangladesh National Building Code. The top management is also suggested to employ a full-time doctor at the factory clinic.

CONCLUSION AND POTENTIALS FOR FURTHER RESEARCH

The successful occupational S&H practice ensures the productivity of the workers, which secures the profitability of an organization. The study was made on 12 apparel industries of Chattogram Bangladesh, where 120 female workers were selected randomly. According to the study, the apparel industries are thriving in many aspects of occupational S&H practice. They are found very successful in installing a sufficient number of fire safety equipment and first aid box. However, the results of regularly of S & H training are also found impressive. However, the sample apparel factories are struggling to maintain fire safety equipment, and there is a lack of adequate fire exit. The study shows that occupational S&H condition is impressive and improved compared to earlier times. The management of the apparel industries should take a participative approach to improve the condition of S&H practice, which will also promote the company's image. Best practices in S&H will make Bangladesh more competitive to the global market.

Reference

Akbar-Khanzadeh, F., & Ramsey, J. D. (1987). The prediction of temperatures and heat stress limits in the workplace with natural ventilation. *American Industrial Hygiene Association Journal*, *48*(4), 396-399.

Akhter, S., Salahuddin, A. F. M., Iqbal, M., Malek, A. B. M. A., & Jahan, N. (2010). Health and occupational safety for female workforce of garment industries in Bangladesh. *Journal of Mechanical Engineering*, *41*(1), 65-70.

Alam M.J., Mamun M.Z. , and Islam, N. (2004). "Workplace Security of Female Garments Workers in Bangladesh," *Social Science Review,21*(2),191-200.

Amin (2009), Coordinator of the Bangladesh Garment Workers Unity Council, extracted from

Rahman, M.A. and Hossain, M.S. (2010).Compliance Practices in Garment Industries in Dhaka City, *Journal of Business and Technology Dhaka, 5*(2) p-73

Danso, F. O. (2010). *Occupational Health and Safety issues involving casual workers on building construction sites in Ghana, a Kumasi study* (Doctoral dissertation).

Ford, A. (2000). Academic Credit for Statistical Analysis of the Effectiveness of Health and Safety Programs. (UMI No. 1400438). Ann Arbor, MI: Bell and Howell Information and Learning Center.

Friis, R. H. (2014). *Occupational health and safety for the 21st century*. Jones & Bartlett Publishers.

Goelzer, B., Hansen, C. H., &Sehrndt, G. (2001). *Occupational exposure to noise: evaluation, prevention and control*. World Health Organization.

Goetsch, D. (1996). Occupational Safety and Health in the age of High Technology for Technologists, Engineers, and Managers. Englewood Cliffs, NJ: Prentice Hall.

Gray, G. C. (2009). The responsibilization strategy of health and safety: Neo-liberalism and the reconfiguration of individual responsibility for risk. *The British Journal of Criminology*, *49*(3), 326-342.

Grubbs, J. (1999). The Transformational Leader: Want Real Improvement in Safety? Promote

Leaders whose clear vision and values inspire your organizations. *Occupational Health and Safety,* August 1999, 22-26.

Hammer, L. B., Johnson, R. C., Crain, T. L., Bodner, T., Kossek, E. E., Davis, K. D., ... &

Berkman, L. (2016). Intervention effects on safety compliance and citizenship behaviors: Evidence from the work, family, and health study. *Journal of Applied Psychology*, *101*(2), 190.

Hansen, S. F., &Tickner, J. A. (2007). The challenges of adopting voluntary health, safety and environment measures for manufactured nanomaterials: lessons from the past for more effective adoption in the future. *Nanotech. L. & Bus.*, *4*, 341.

Hasan, I. (2018). Health and Safety Compliance in the Readymade Garment Sector of Bangladesh: Practices and Observations. *Available at SSRN 3631346*.

Health and Safety Executive (2011).Successful health and safety management. Retrieved from www.nationalarchives.gov.uk/doc/open-government

Healy, J. (2016). *Improving health care safety and quality: reluctant regulators*. Routledge.

Honkasalo, A. (2000). Occupational Health, Safety and Environmental Management System. *Environmental Science and policy,3,* 39-45.

Huda, K. N. (2016). State of Health and Safety Compliance in the Readymade Garments Industries: An Evaluative Study. *IIMS Journal of Management Science*, *7*(1), 55-66.

Huda, K.N., Shakil, R.M., & Islam, M.S. (2018). Perceptions of Workers on the Effectiveness of Health & Safety Training In the RMGs of Bangladesh: An Evaluation Subsequent to Rana Plaza Tragedy, *North South Business Review*, *9*(1), 69-91

Islam, M. S., Rakib, M. A., & Adnan, A. (2016). Ready-made garments sector of Bangladesh: Its contribution and challenges towards development. *Stud*, *5*(2).

Kunyk, D., Craig-Broadwith, M., Morris, H., Diaz, R., Reisdorfer, E., & Wang, J. (2016).

Employers' perceptions and attitudes toward the Canadian national standard on psychological health and safety in the workplace: A qualitative study. *International journal of law and psychiatry*, *44*, 41-47.

Lingard, H. (2002). The effect of first aid training on Australian construction workers' occupational health and safety motivation and risk control behavior. *Journal of safety research*, *33*(2), 209-230.

Mahmud, S. (2009). Why do garments workers in Bangladesh fail to mobilize?, Bangladesh Institute of Development Studies

Mansdorf, Z. (1999). Organizational culture and safety performance. *Occupational Hazards*, *61*(5), 109-112.

Mwombeki, F. K. (2005, May). Occupational health and safety challenges in construction sites in Tanzania. In *The W99 Triennial International Conference, Rethinking and Revitalizing Construction Safety, Health, Environment and Quality* (pp. 778-789).

Okoye, P. U., Ezeokonkwo, J. U., & Ezeokoli, F. O. (2016). Building construction workers' health and safety knowledge and compliance on site. *Journal of Safety Engineering*, *5*(1), 17-26.

Quddus, M. and Rashid, S. (2000). "Entrepreneurs and Economic Development: the remarkable story of garment exports from Bangladesh, *Journal of Bangladesh Studies,2*(1) 65-66.

Rahimi, M. (1995). Merging Strategic Safety, Health, and Environment into Total Quality Management. *International Journal of Industrial Ergonomics,16,* 83-94.

Rahman, M. and Hossain, M. (2010).Compliance Practices in Garment Industries in Dhaka City, *Journal of Business and Technology Dhaka,5*(2),71

Saari, J. (1992). Successful Implementation of Occupational Health and Safety Programs in manufacturing for the 1990's. *International Journal of Human Factors in Manufacturing,2*(1), 55-66.

Shikdar, A. A., &Sawaqed, N. M. (2003). Worker productivity and occupational health and safety issues in selected industries. *Computers & industrial engineering*, *45*(4), 563-572.

Siddiqi, H. (2005). The Ready Made Garment Industry of Bangladesh. (2nd ed.). Dhaka: The University Press Limited.

Tamanna, U. (2010). *Labor unrest in Bangladesh APPAREL sector: does active labour union reduce the risk of labor unrest in APPAREL sector?* (Doctoral dissertation, BRAC University).

The Daily Star (2014, April 24). Staff Correspondence. Retrieved from http://www.thedailystar.net/executive-director-of-centre-for-policy-dialogue-on-the-rana-plaza-tragedy-21987

The Financial Express (2008), extracted from Rahman, M.A. and Hossain, M.S.

(2010).Compliance Practices in Garment Industries in Dhaka City, *Journal of Business and Technology Dhaka*, 5(2), 73

Ulinfun, C. (2002). *Essential safety measures for accident and injury reduction in the workplace* (Doctoral dissertation).

Ulutasdemir, N., Kilic, M., Zeki, Ö., &Begendi, F. (2015). Effects of occupational health and safety on healthy lifestyle behaviors of workers employed in a private company in Turkey. *Annals of global health*, *81*(4), 503-511.

Vincoli, J. (1993). Basic Guide to System Safety. New York, NY: Van Nostrand Reinhold.Yapp, C., &Fairman, R. (2006). Factors affecting food safety compliance within small and medium-sized enterprises: implications for regulatory and enforcement strategies. *Food control*, *17*(1), 42-51.

Yorio, P. L., &Wachter, J. K. (2014). The impact of human performance focused safety and health management practices on injury and illness rates: Do size and industry matter?. *Safety science*, *62*, 157-167.

Zeng, S. X., Tam, V. W., & Tam, C. M. (2008). Towards occupational health and safety systems in the construction industry of China. *Safety science*, *46*(8), 1155-1168.

Zile, M. (2018). Measures to be determined and received in universities of occupational health and safety risks. *Turkish Journal of Engineering*, *2*(1), 35.

Zin, S. M., & Ismail, F. (2012). Employers' behavioral safety compliance factors toward occupational, safety and health improvement in the construction industry. *Procedia-Social and Behavioral Sciences*, *36*, 742-751.