



CASE REPORT

# Upper respiratory tract infections and academic attainment: A case study

Andrew P. Smith\*

Centre for Occupational and Health Psychology, School of Psychology, Cardiff University, Cardiff, Wales, United Kingdom

ARTICLE INFO

*Article history:*

Received: February 23, 2022

Revised: March 11, 2022

Published online: March 31, 2022

*Keywords:*

upper respiratory tract infections

common cold

influenza

academic attainment

*\*Corresponding author:*

Andrew P. Smith

Centre for Occupational and Health Psychology, School of Psychology, Cardiff University, Cardiff, Wales, United Kingdom.

E-mail: [smithap@cardiff.ac.uk](mailto:smithap@cardiff.ac.uk)

© 2022 Author(s). This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License, permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

**Background:** There has been extensive research showing that upper respiratory tract infections (URTIs), such as the common cold and influenza, can impair mental performance. Much of this research has involved studies of experimentally induced URTIs or laboratory studies of naturally occurring illnesses. The results from this research have implications for performance at work and in education.

**Aims:** The present article presents a case study of the association between URTIs and academic performance and reports the use of such information as an extenuating circumstance for poor performance.

**Methods:** The paper describes the poor performance of a primary school student taking the 11+ examination, which determines the choice of the future secondary school. Evidence suggested that it was plausible that the student was incubating an URTI at the time of the examination. Other possible infections, such as COVID, were ruled out. An appeal was made based on the possible association between incubating an URTI and unusually poor examination performance.

**Results:** The appeal was supported by the adjudicating committee and the student was allowed a place in the preferred secondary school.

**Conclusions:** This case study shows that information about the association between URTIs and mental performance can be used as an extenuating circumstance that can plausibly account for poor academic performance. This can form the basis of the future appeals and recommendations for the type of evidence needed to make such claims are made.

**Relevance for Patients:** URTIs are frequent, common, and a cause of absence from education and work. They may also impair performance, with effects not being restricted to the time the person is symptomatic. They may also increase susceptibility to the negative effects of stress and fatigue.

## 1. Introduction

Over the past 30 years, there has been extensive research on the association between upper respiratory tract infections (URTIs) and mental performance [1]. This research initially started with the examination of the effects of experimentally induced URTIs on tests measuring underlying cognitive functions [2]. The results showed that viruses leading to the common cold led to psychomotor slowing, whereas influenza viruses impaired selective and sustained attention [3,4]. The effects of the URTIs were not restricted to the time that the person was symptomatic but were observed in those with sub-clinical infections [5], during the incubation period [5], and after the symptoms had gone [6]. Research investigating naturally occurring URTIs confirmed many of the results from the earlier research [7,8]. Furthermore, the research not only identified the direct effects of URTIs but showed that

having an URTI made individuals more sensitive to other negative factors such as stress [9] or fatigue [10].

The above results have important implications for real-life activities such as driving and having an URTI has been shown to impair performance on driving simulators [11,12]. The results also suggest that impairments due to URTIs may be observed in occupational and educational settings. One of the best examples of the impact of influenza in the workplace is a case study of the after-effects of influenza on the skilled performance of a technician [13]. The person described in the study was a skilled technician who had been absent from work with influenza. When he returned to work, he made elementary mistakes in calibrating machinery and proceeded to collect incorrect data, which he only rejected several weeks later. There have also been epidemiological studies on the impact of URTI on the academic performance of university students [14]. This research studied nearly 5000 students for a 6-month period from November to the end of April. Over 45,000 days of illness due to URTIs were reported. Of those with URTIs, 27.8% did poorly on an examination, and 46.3% did poorly on coursework.

The present paper reports a case study of a primary school student who normally had very high academic grades and did very badly on the 11+ examination, which is used to determine the choice of secondary school. Evidence concerning the impact of an URTI was evaluated and, together with evidence on the behavioral effects of URTIs, was submitted as an extenuating circumstances appeal.

## 2. Methods

The author of the paper was approached by the parents of a 10-year-old student who had performed unusually badly in an 11+ examination. They had been aware of a decline in his health and asked for an opinion from an expert witness on whether the poor performance could plausibly be linked to an URTI. The next sections describe the student's past performance and health at the time of the examination. The results section covers the information provided to the extenuating circumstances committee and their decision.

### 2.1. The past academic record of the student

The recent academic achievement scores for the student were made available. All areas showed that the student was either in line with National Age-related Expectations or above those expectations. Both the attitude to learning and pupil's behavior were exceptionally high. The teacher judgment for specific domains (English, Maths, and Science) was above age-related expectations. The most relevant teacher comment was that "Student X --- is working 10–12% above the standardized equivalent for the 11+ pass mark."

### 2.2. Events close to the 11+ examination

The following summary describes events before and after the 11+ examination.

- Friday September 3, 2021  
The school term starts.

- Tuesday and Wednesday September 7–8, 2021  
Evening walks with \*\*\*\* in an attempt to manage examination stress/anxiety.
- Thursday September 9, 2021  
\*\*\*\* sits Secondary Transfer Test (the 11+ Test).
- Friday September 10, 2021  
\*\*\*\* starts to show symptoms in the evening with headache, runny nose, sneezing, and fatigue.
- Saturday September 11, 2021  
Symptoms worsen – a particularly bad cough and tiredness.
- Sunday September 12, 2021  
Symptoms become more severe – extreme fatigue and lethargy, coughing more persistent, breathing sounds wheezy, sleep is disturbed, and headache.
- Monday September 13, 2021  
Symptoms persist. \*\*\*\* kept from school, and the school office was informed. A COVID PCR test is carried out.
- Tuesday September 14, 2021  
\*\*\*\* kept home from school; a negative PCR test result was received.
- Wednesday September 15, 2021  
\*\*\*\* is still too ill to return to the school; the school is notified.
- Thursday September 16, 2021  
\*\*\*\* is sufficiently recovered to return to lessons, but no PE.

### 2.3. Parents approach Professor Smith

On the October 21, 2021, the father of the student sent the following E-mail:

*"Dear Professor Smith,*

*I have read with great interest reports of your article concerning the effects that a virus can have on cognitive function even before physical symptoms are showing.*

*I came across it whilst carrying out some research as our son's school has asked us to consider what were the unusual circumstances around the time he sat his 11+ exam that may have caused his result to come out significantly lower than they had expected and below that predicted by various mock tests and his CAT scores.*

*We have looked back at the period and identified that on the evening after his examination, he started to feel unwell and deteriorated further, and then had to be kept off school the following week with a very bad cold, cough, flu, haziness, and fatigue symptoms. His PCR and lateral flow tests indicated, he was negative for COVID.*

*His headteacher had put him in the "Exceptionally able so very highly recommended" and "Enjoys a challenge and is a highly motivated independent learner" categories in her recommendation to the local authority before the date of the examination. We're considering the likelihood that he was already suffering symptoms as well as pre-exam anxiety and the possibility that this was negatively impacting the very qualities, he most needed to succeed in the examination.*

*We would be very grateful if you were available to discuss this in the context of your findings and perhaps to consult with you on any possible correlation?"*

Following this E-mail, there were several telephone conversations and E-mail exchanges aimed at providing more detailed information. These were then reviewed and a letter was sent to the Selection Review Panel. The review process is entirely in writing. The panel consists of two grammar school headteachers and one junior school headteacher.

### 3. Results

#### 3.1. Professor Smith's letter to the review panel

The following letter and supporting appendices were sent to the review panel. Appendix 1 has been outlined in section 2.2 of the paper. References to Appendix 2 [15], Appendix 3 [14], Appendix 4 [4,5] and Appendix 5 [9] are provided at the end of this article.

October 28, 2021

*To whom it may concern*

*Re: Extenuating circumstances relating to the exam performance of \*\*\**

*I have been asked by \*\*\*\*'s parents to review the extenuating circumstances relating to his underachievement in a recent examination. I have been asked to do this because I am an expert on the effects of URTIs and performance, a topic that I have researched for over 30 years.*

*The first issue I am going to cover is whether it is likely that \*\*\*\* was incubating an illness on the day of his examination. His parents have provided me with details of his subsequent illness (Appendix 1) which appears to be an URTI such as influenza or the common cold. These illnesses can take 24–96 h to develop after infection, making it likely that he was incubating the illness on the day of his examination. Data from Public Health England (Appendix 2) show that URTIS increased during this week due to children starting back to school.*

*The second issue to address is whether URTIs impair academic performance. A paper on this topic is shown in Appendix 3, and the results demonstrate that these illnesses can impair examination performance by up to 30%.*

*One must now ask whether performance during the incubation period is also impaired due to infection, even though the person is not symptomatic. One of the first studies we carried out at the MRC Common Cold Unit (Appendix 4) showed that performance was impaired during the incubation period, with the impairment being in the region of about 10%. Another finding from my research (Appendix 5) shows that URTIs can make the person more sensitive to stressful situations, and examinations would fall in this category.*

*Overall, my conclusion is that it is likely that Student X's examination performance was impaired due to the developing infection. I hope that the panel will give this serious consideration when considering his appeal."*

#### 3.2. The decision of the selection review panel

On the February 9, 2022, \*\*\*\*'s parents received the following E-mail from School Admission:

*"We are writing to let you know the outcome of \*\*\*\*'s Selection Review. We are pleased to tell you that the review was successful. What happens next?"*

*This means that \*\*\*\* is now qualified for admission to any \*\*\*\* grammar school. The preferences that you expressed for these schools will be considered in the first allocation round. Your home local authority will let you know the outcome of your secondary school application on March 1, 2022."*

### 4. Discussion

It is very common for the authors of fundamental research to discuss the practical implications and applications of their results. Unfortunately, the translation process is often not achieved. The present case study shows that basic research on the behavioral effects of URTIs can be used to support extenuating circumstances appeals in education. The success of the present appeal depended on some crucial features of the supporting documentation. First, the suggested illness occurred when URTIs were prevalent. Second, subsequent symptoms suggested that at the time of the examination, the person was incubating an URTI. This is likely to have been a severe cold or influenza, as the PCR test for COVID was negative.

The supporting literature based on laboratory and epidemiological studies suggests that URTIs can impair academic performance. The laboratory research demonstrated that such effects can occur in the incubation period and that URTIs can make the individual more susceptible to the negative effects of stress. Taking an examination can be very stressful and this was confirmed here by the parents. Overall, the evidence presented was sufficiently strong for the Selection Review Panel to agree with the extenuating circumstances appeal. This could set a precedent for the future appeals. It should be pointed out that these are only likely to be successful if the relevant, plausible information is reported.

### 5. Conclusion

This case study demonstrates that the research literature on URTIs and mental performance can be used as supporting evidence in extenuating circumstances appeals. It also outlines the nature of the evidence needed when such appeals are made.

### Acknowledgments

The author would like to acknowledge all of the collaborators in research on the behavioral effects of URTIs, especially the late David Tyrrell, who allowed me to conduct my early studies at the MRC Common Cold Unit, Salisbury UK.

### Conflict of Interest

The author declares no conflict of interest.

### Funding

There was no funding associated with the present project.

### References

- [1] Smith AP. Twenty-Five Years of Research on the Behavioural Malaise Associated with Influenza and the Common Cold.

- Psychoneuroendocrinology 2013;38:744-51.
- [2] Smith AP. Respiratory Virus Infections and Performance. *Philos Trans R Soc London B Biol Sci* 1990;327:519-28.
- [3] Smith AP, Tyrrell DA, Coyle K, Willman JS. Selective Effects of Minor Illnesses on Human Performance. *Br J Psychol* 1987;78:183-8.
- [4] Smith AP, Tyrrell DA, Al-Nakib W, Coyle KB, Donovan CB, Higgins PG, *et al.* Effects of Experimentally Induced Respiratory Virus Infections and Illnesses on Psychomotor Performance. *Neuropsychobiology* 1987;18:144-8.
- [5] Smith AP, Tyrrell DA, Al-Nakib W, Coyle KB, Donovan CB, Higgins PG, *et al.* The Effects of Experimentally Induced Respiratory Virus Infections on Performance. *Psychol Med* 1988;18:65-71.
- [6] Smith AP, Tyrrell DA, Al-Nakib W, Barrow GI, Higgins PG, Leekam S, *et al.* Effects and after-effects of the Common Cold and Influenza on Human Performance. *Neuropsychobiology* 1989;21:90-3.
- [7] Smith AP, Thomas M, Brockman P, Kent J, Nicholson KG. Effect of Influenza B Virus Infection on Human Performance. *Br Med J* 1993;306:760-1.
- [8] Smith A, Thomas M, Kent J, Nicholson K. Effects of the Common Cold on Mood and Performance. *Psychoneuroendocrinology* 1998;23:733-9.
- [9] Smith AP. Effects of Upper Respiratory Tract Illness and Stress on Alertness and Reaction Time. *Psychoneuroendocrinology* 2013;38:2003-9.
- [10] Smith AP. Fatigue, Susceptibility to the Common Cold and its Behavioural Effects. *Med Res Arch* 2021;9:1-14.
- [11] Smith A. Effects of the Common Cold on Simulated Driving. In: Bust, PD, editor. *Contemporary Ergonomics*. London: Taylor & Francis; 2006. p. 621-4.
- [12] Smith AP, Jamson SL. An Investigation of the Effects of the Common Cold on Simulated Driving Performance and Detection of Collisions: A Laboratory Study. *BMJ Open* 2012;2:e001047.
- [13] Grant J. Post-influenzal Judgement Deflection among Scientific Personnel. *Asian J Med* 1972;8:535-9.
- [14] Nichol KL, D'Heilly S, Ehlinger E. Burden of Upper Respiratory Illnesses among College and University Students: 2002-2003 and 2003-2004 Cohorts. *Vaccine* 2006;24:6724-5.
- [15] Public Health England Syndromic Surveillance Summary 2021 Week 36. Available from: [https://www.assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1017940/PHESyndromicSurveillanceSummary2021Week36.pdf](https://www.assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1017940/PHESyndromicSurveillanceSummary2021Week36.pdf)

#### **Publisher's note**

Whioce Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.