Investigating relationships between the usage of Mathematics Learning Support and performance of at-risk students

Emma Berry, Dr. Ciarán Mac an Bhaird, Dr. Ann O'Shea,
Department of Mathematics and Statistics.
Maynooth University, Ireland

Overview

- The MSC was established in Maynooth University in 2007
- The MSC was originally set up to help students who were deemed "at risk" of failing first year, these are the students who either
  - failed a diagnostic test given at the start of the year or
  - received a B or lower in Ordinary level Maths for their Leaving Certificate
- Initial research found strong evidence of a relationship between support centre attendance and success in exams, particularly for "at risk" students
- In recent years the number of students availing of this service has increased dramatically

Overview

Year	Number Students Registered	Number of visits
2012/2013	933	14,927
2011/2012	849	13,895
2010/2011	600	7,898
2009/2010	599	7,262
2008/2009	509	4,647
2007/2008	273	2,493

Number of students studying mathematics stable at approx. 1000

Overview

Concerns:

a. Was the group it was originally intended for still using it and were they still benefitting from it?

b. What is the relationship, if any, between duration of time spent at the drop in sessions and student success?

c. Were the days of the week in which students attended important for student success?

Literature Review

- Majority of research in this area is of a quantitative nature & looks at impact by considering the success rate of students.
  - Previous MSC research suggests a positive correlation between attendance and mathematics module grades
  - Results suggested support benefited "weak" students and aided student retention
  - However, a significant minority of students most in need of the support do not avail of it.

Methodology

How we run our MSC

- 22 hour week term time (24 weeks)
- Open during mid-term breaks & study weeks before exams.
- Any undergraduate student can avail of drop-in service – no appointments.
- Deal with problems like:
  - Queries on lecture notes
    - Not understanding Material
    - Notation
  - How to use "mathematical language"
  - Help with problems related to assignment questions

Methodology

The Data

- From MSC:
  - Forms Containing:
    - Student name
    - Student number
    - Course
    - Date
    - Additional Comments
  - Duration of visits

- From Department
  - Module results
  - Tutorial attendance
  - Assignments grades
  - Diagnostic test scores
  - Leaving Certificate results (which they provide on diagnostic test sheet)

Methodology

What we do with the Data

- Analyse data using SPSS
  - Compare grades of students with similar mathematical background who have different levels of engagement with the MSC.
- Provide brief internal report
- Present summary of results to students at the start of the following year.

Results

Number of visits for First Science cohort

- Attendance Figures for 2011/12

At-risk category	Attended once or less	Attended more than once	Total
Not at-risk	86	126	212
At-risk	58	111	169
Total	144	237	381

- Attendance Figures for 2012/13

| At-risk category	Attended once or less	Attended more than once	Total
Not at-risk	60	169	229
At-risk	31	127	158
Total	91	296	387

Results

- Evidence that the distribution of the number of visits to the MSC was not the same for at-risk and not at-risk groups in 2012/2013 Mann-Whitney U test, p=0.018

- In 2011/2012, there is only slight evidence of a difference between the two. Mann-Whitney U test p=0.06

Year	At risk visits	Total Visits
2011/2012	2068	3942
2012/2013	2400	5268
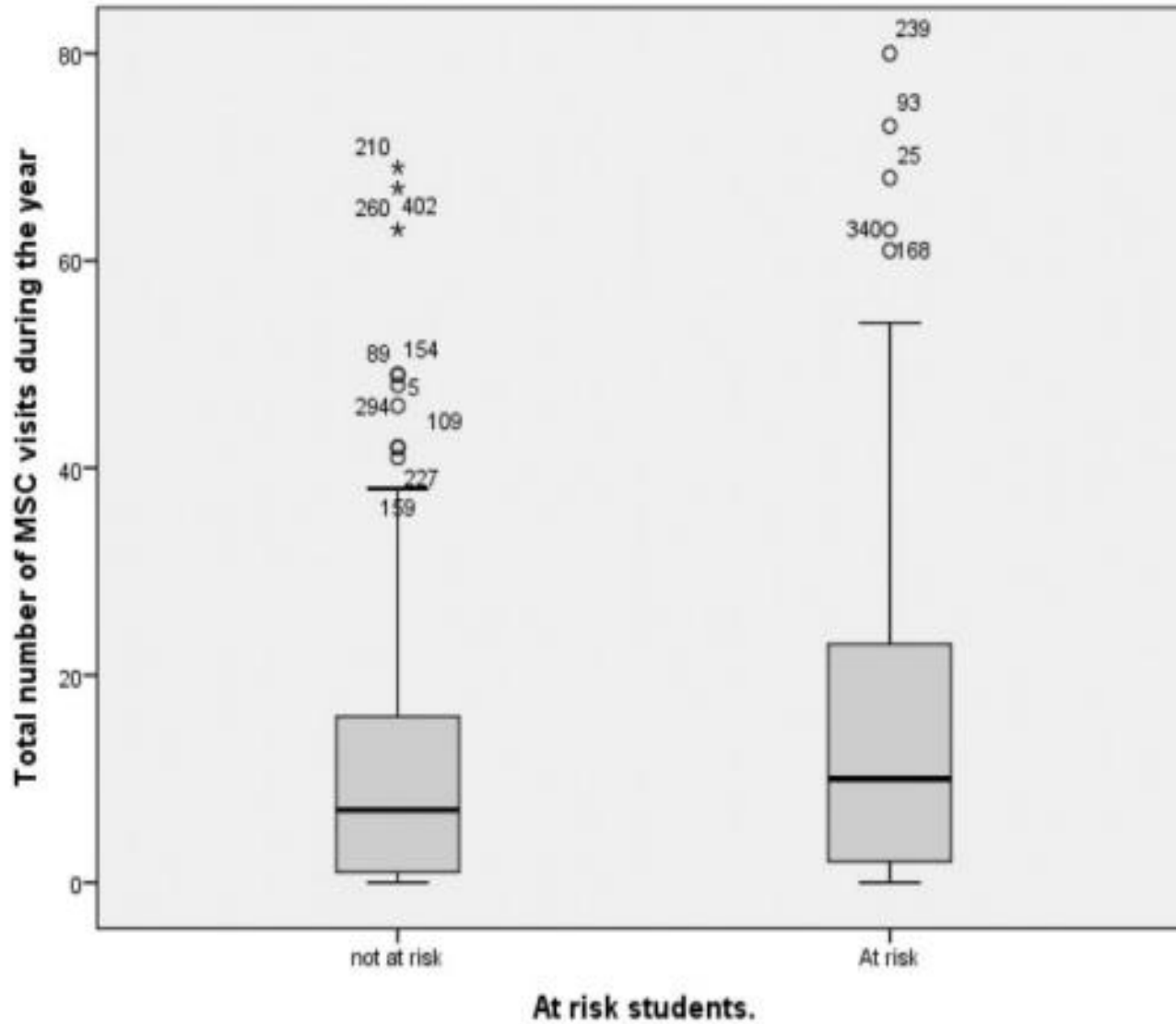
Number of visits to the MSC in 2012/13
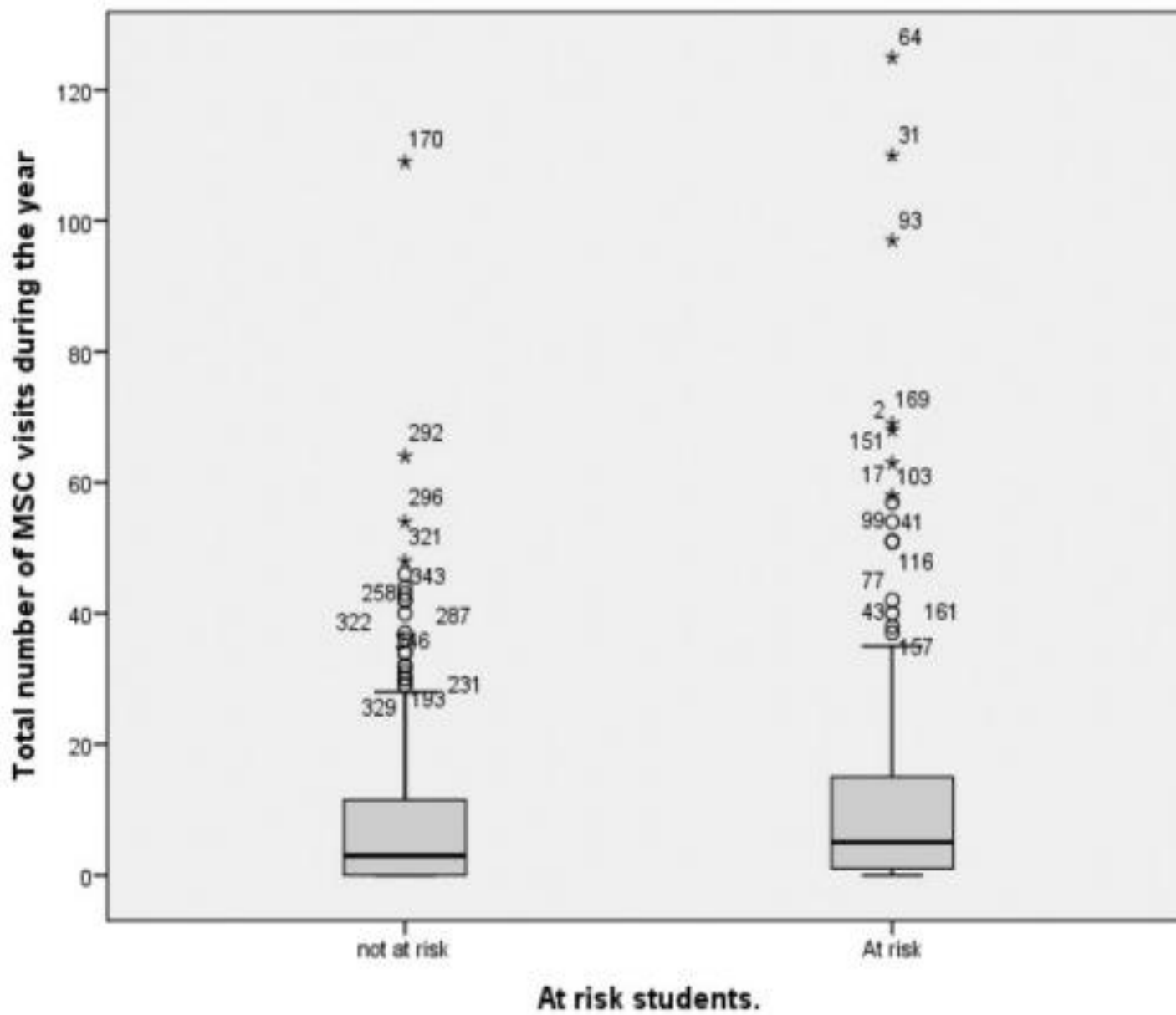
Number of visits to the MSC in 2011/12

Results

- There was evidence that the distribution of time spent in the MSC was not the same for at risk and not at risk students.
  - Mann-Whitney U test, p=0.0017 2012/13
  - Mann-Whitney U test, p=0.0012 2011/12

  with at risk students staying longer

- Hours Spent in the MSC

Group	Mean	Median
At-risk 2011/12	15.72	5.25
Not at-risk 2011/12	10.52	2.92
At-risk 2012/13	19.36	11
Not at-risk 2012/13	13.86	7.92

Results

Days of visits

- Grouped students into those who spent more time:
  - Monday-Wednesday
  - Thursday-Friday

- In 2012/13 At risk less likely than not-at risk to spend more time in the MSC later in the week (chi-square test, $p=0.046$)

- Majority of both groups spent more time in MSC earlier in the week
  - 82.8% At-risk
  - 73.6% Not at-risk

Results

- However the proportion of students who successfully passed end-of year examinations in 2012/13 was independent of whether the students spent more time in the MSC earlier in the week
  - Chi-squared test, p = 0.75, At-risk
  - Chi-squared test, p = 0.634, Not at-risk

Results

Relationship between attendance and grades

- First Year Science students who sat final exams

Year	At-risk	Total
2011/12	146	340
2012/13	140	384

- Multiple regression to compare their Overall result and:
  - Leaving Certificate point score
  - Diagnostic Test score
  - Number of visits to the MSC
  - Number of minutes spent in the MSC
- Each predictor variable had significant correlation with Overall Result

Results

Predictors for the Overall Result

- 2011/12
  - Leaving Certificate points
  - Diagnostic test scores
  - Time spent in the MSC

with $R^2 = 0.397$

- 2012/13
  - Leaving Certificate points
  - Diagnostic test scores
  - Number of visits to the MSC

with $R^2 = 0.156$

- Variables had positive coefficients in both models

Conclusion/Discussion

- At-risk students were still availing of the MSC

- They were more likely to attend and stay for longer than not at-risk

- At-risk students who attend the MSC do better on average than those who do not.

- Regression analysis showed that
  - Leaving Certificate points
  - Diagnostic test results
  - Number MSC visits (2012/13) or Time in MSC (2011/12)

  were predictors for overall result but did not explain majority of variance.

Conclusion/Discussion

- On average, at-risk students spent longer per visit in the MSC than not at-risk (2012/13)

- Pass rates & mean overall result for at-risk students who spend 26 hours or more in the MSC were significantly higher than those who do not

- At-risk students less likely to spend more time in the MSC later in the week

- Did not find any evidence of a relationship between success of students and early/late in the week

Thank you, Any questions?

Berry, Emma, Ciarán Mac An Bhaird, and Ann O'Shea. "Investigating relationships between the usage of Mathematics Learning Support and performance of at-risk students." *Teaching Mathematics and its Applications*(2015): hrv005.