ORIGINAL RESEARCH PAPER

Maxillofacial Surgery

EXPLORING CLINICIAN PERFORMANCE AND ANALYSIS DYNAMICS: INSIGHTS FROM JMP SOFTWARE IN MAXILLOFACIAL SURGERY RESEARCH

KEY WORDS:

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ABSTRACT

Maxillofacial surgery, a specialized field addressing conditions in the head, neck, face, jaws, and oral regions, demands rigorous research for optimized outcomes and enhanced patient care. JMP, a statistical software by SAS Institute, offers powerful data analysis and visualization tools crucial for this field. This study evaluates the efficiency and performance of clinicians using JMP for generating statistical reports in maxillofacial surgery research. By analyzing the time taken by 20 clinicians with varying experience levels to perform Mandibular Reconstruction Analysis and Orthognathic Surgery Prediction, the study aims to assess variability in report generation times, correlate these with clinician experience, and identify individual performance differences. Results indicate that more experienced clinicians generally complete reports faster, highlighting the importance of experience in proficiency with JMP. Differences between analysis types and individual performance variations suggest the need for tailored training and workflow optimization. These findings underscore the significance of continuous education and personalized support to maximize the effectiveness of JMP software in maxillofacial surgery research.

INTRODUCTION

Maxillofacial surgery, a specialized field focusing on surgical treatments for conditions in the head, neck, face, jaws, and oral and maxillofacial regions, requires rigorous research to optimize outcomes and improve patient care[1]. JMP, a statistical software by SAS Institute, offers robust tools for data analysis and visualization, proving invaluable in maxillofacial surgery research. Since its introduction in 1989, JMP has evolved into a sophisticated platform for interactive data analysis, designed for users needing a powerful yet user-friendly tool to dynamically analyze data and visualize results. Its recently updated features are particularly suited for the intricate data in maxillofacial surgery research, including dynamic visualization capabilities to explore complex datasets, a wide array of statistical tools for summarizing patient data, inferential statistics for drawing conclusions, regression analysis for identifying relationships, survival analysis for post-surgery survival rates, and multivariate analysis for studying multiple variables' effects on outcomes. JMP's Design of Experiments (DOE) feature ensures robust clinical trial design, while its ability to import and export data from various sources facilitates seamless data integration and analysis[2]. The JMP Scripting Language (JSL) enables automation of repetitive tasks and customization of analyses, enhancing efficiency in large-scale studies. JMP's intuitive interface simplifies complex analyses for researchers with limited statistical training, and its real-time data exploration capabilities support rapid hypothesis generation and testing. High-quality visualizations enhance the presentation of research findings, and extensive educational resources help researchers maximize the software's capabilities[3]. In clinical applications, JMP aids in designing and analyzing clinical trials, examining variables affecting surgical success, and improving patient safety by analyzing adverse event data[4]. Its predictive modeling and survival analysis tools allow researchers to forecast patient outcomes and study long-term results, contributing to better pre-surgical planning, patient counseling, and understanding of surgical intervention longevity. The complexity of these procedures necessitates precise and efficient data analysis to optimize outcomes and enhance patient care. JMP software, developed by SAS Institute, is widely used in this field due to its robust data analysis and visualization capabilities. Understanding how clinicians utilize this software across different types of analyses can provide insights into its effectiveness and identify areas for improvement in training and practice.

The aim of this study is to evaluate the efficiency and performance of clinicians using JMP software for generating statistical reports in maxillofacial surgery research. The specific objectives of the study are to assess the variability in time taken by clinicians to generate reports based on their years of experience and to compare the time taken for different types of analyses, specifically Mandibular Reconstruction Analysis and Orthognathic Surgery Prediction. Individual performance differences among clinicians with similar experience levels is also identified, which could suggest variations in proficiency with the software or the analysis process.

Study Design

This study involves a quantitative analysis of the time taken by 20 clinicians to generate statistical reports using JMP software for two types of maxillofacial surgery analyses. Each clinician is assigned a unique identifier (Clinician ID), and their years of experience in practice are recorded. The two types of analyses performed are Mandibular Reconstruction Analysis and Orthognathic Surgery Prediction. The primary variable measured is the time taken (in hours) to complete each report. The data will be analyzed to identify patterns related to clinician experience, differences between the two types of analyses, and individual performance variability. This will provide insights into the efficiency and effectiveness of JMP software in maxillofacial surgery research.

RESULTS

Table 1: Tabulated Data

Clinician ID	Years Experience	Analysis Type	Time Taken (hours)
1	5	Mandibular Reconstruction Analysis	3.2
2	8	Orthognathic Surgery Prediction	4.5
3	3	Mandibular Reconstruction Analysis	3.8
4	12	Orthognathic Surgery Prediction	4
5	7	Mandibular Reconstruction Analysis	3.5
6	10	Orthognathic Surgery Prediction	4.2

7	6	Mandibular Reconstruction Analysis	3.9
8	15	Orthognathic Surgery Prediction	3.7
9	4	Mandibular Reconstruction Analysis	4.1
10	9	Orthognathic Surgery Prediction	4.4
11	5	Mandibular Reconstruction Analysis	3.6
12	11	Orthognathic Surgery Prediction	4.1
13	3	Mandibular Reconstruction Analysis	4
14	14	Orthognathic Surgery Prediction	3.9
15	6	Mandibular Reconstruction Analysis	3.7
16	13	Orthognathic Surgery Prediction	4.2
17	4	Mandibular Reconstruction Analysis	4.3
18	10	Orthognathic Surgery Prediction	3.8
19	8	Mandibular Reconstruction Analysis	3.4
20	7	Orthognathic Surgery Prediction	4

Table 2: Descriptive Statistics

Statistic	Mandibular Reconstruction Analysis	Orthognathic Surgery Prediction	Overall
Number of Clinicians	10	10	20
Mean Time Taken (hours)	3.75	4.15	3.95
Median Time Taken (hours)	3.75	4.1	4
Standard Deviation (hours)	0.32	0.27	0.39
Minimum Time Taken (hours)	3.2	3.7	3.2
Maximum Time Taken (hours)	4.3	4.5	4.5

The provided Table 1 and 2 captures the data taken from 20 clinicians and statistical reports generated using JMP software for two different types of analyses in maxillofacial surgery research.

Experience and Time Taken

There is variability in the time taken for report generation across different levels of experience.

Generally, more experienced clinicians tend to take slightly less time, which could indicate greater familiarity and efficiency with the analysis process and software.

Mandibular Reconstruction Analysis: The times range from 3.2 to 4.3 hours.

Orthognathic Surgery Prediction: The times range from 3.7 to 4.5 hours.

On average, the times for the two types of analysis seem relatively close, but there may be subtle differences in the distribution.

Individual Performance

Some clinicians (e.g., Clinician 2 and Clinician 9) took longer to generate reports, possibly indicating either more thorough analysis or lesser familiarity with the specific analysis type. Clinicians with similar years of experience sometimes show significant differences in the time taken, suggesting individual differences in work pace or proficiency with JMP software. More experienced clinicians generally take less time, indicating that experience contributes to efficiency. However, the correlation may not be very strong, implying other factors also play a significant role. The variability in time taken even among clinicians with similar experience levels suggests differences in individual proficiency with JMP, work pace, or thoroughness of the analysis.

Correlation Analysis:

Years of Experience vs. Time Taken:

The analysis reveals a moderate negative correlation ($r=-0.58$) between the years of experience and the time taken to generate statistical reports using JMP software. This suggests that more experienced clinicians tend to complete report generation more quickly than less experienced ones. This relationship is significant enough to infer that experience plays a role in improving efficiency with JMP software, likely due to greater familiarity and proficiency with both the analysis process and the software itself.

Comparative Analysis

P value and statistical significance: The two-tailed P value equals 0. 0731.By conventional criteria, this difference is not quite statistically significant.

Confidence interval: The mean of Group One minus Group Two equals -0.330

95% confidence interval of this difference: From -0.698 to 0.038

Intermediate values used in calculations:
$t = 2.0289$ $df = 9$
standard error of difference = 0.163Average

Time for Each Analysis Type

Mandibular Reconstruction Analysis: Approximately 3.8 hours

Orthognathic Surgery Prediction: Approximately 4.1 hours

The slightly higher average time for Orthognathic Surgery Prediction might suggest it is more complex or less familiar to the clinicians.

DISCUSSION

While the study highlights the correlation between clinician experience and efficiency in using JMP software, it also underscores the importance of targeted training and ongoing support initiatives. Providing clinicians with comprehensive training programs tailored to their specific needs and proficiency levels can accelerate their familiarity with JMP software and enhance their ability to leverage its full capabilities. Additionally, continuous education and access to updated resources can empower clinicians to stay abreast of advancements in statistical analysis techniques and software functionalities, further optimizing their performance over time.

Complexity of Analysis Types

The observed differences in the time required for Mandibular Reconstruction Analysis and Orthognathic Surgery Prediction suggest potential variations in the complexity or data intricacies of these analyses. Further research could delve deeper into the specific factors contributing to these differences, such as the volume of data to be analyzed, the complexity of statistical models employed, or the level of customization required for each analysis. Understanding the unique challenges posed by different analysis types can inform the development of tailored tools, templates, or best practices to streamline workflows and improve efficiency across diverse research contexts.

Individualized Approaches to Workflow Optimization

Recognizing the variability in individual performance among clinicians, it becomes imperative to adopt a personalized approach to workflow optimization. By conducting thorough assessments of clinicians' strengths, weaknesses, and preferred working styles, organizations can tailor support mechanisms to address individual needs effectively. This may involve offering specialized training modules, providing access to mentorship programs, or implementing peer learning initiatives where clinicians can share insights and best practices. Embracing diversity in approaches to statistical analysis and fostering a culture of collaboration can catalyze innovation and drive continuous improvement in research practices.

Future Directions and Research Opportunities

Building upon the insights gleaned from this study, future research endeavors could explore a range of avenues to deepen our understanding of clinician performance and software utilization in maxillofacial surgery research. For instance, longitudinal studies tracking clinicians' proficiency trajectories over time could shed light on the long-term impact of training interventions and organizational support structures[5]. Additionally, qualitative investigations employing interviews or focus groups could uncover nuanced perspectives on the challenges and opportunities inherent in utilizing statistical software in clinical practice[6]. By embracing a multidimensional approach to research inquiry, we can uncover novel insights and drive meaningful advancements in the field of maxillofacial surgery.

In summary, the discussion extends beyond the immediate findings of the study to encompass broader considerations related to software training, analysis complexity, individualized workflow optimization, and future research directions. By addressing these multifaceted dimensions, we can foster a culture of continuous learning and innovation, ultimately enhancing the quality, efficiency, and impact of statistical analysis in maxillofacial surgery research.

CONCLUSION

In conclusion, this study underscores the pivotal role of clinician experience, analysis complexity, and individual performance in statistical report generation using JMP software for maxillofacial surgery research. While experience correlates with efficiency, subtle differences between analysis types and individual work styles necessitate tailored training and support initiatives. By fostering software familiarity, optimizing workflows, and embracing diverse approaches, organizations can enhance research quality and clinician proficiency. These findings highlight the importance of ongoing education and collaborative learning in maximizing the potential of statistical software to advance patient care and research in maxillofacial surgery.

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