

Lloyd Lowell Messersmith and the Origins of Notational Analysis

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1. Introduction

There is a growing interest in notational analysis as an academic area of study. In this paper I seek to draw attention to one of the pioneers of notation in sport, Lloyd Lowell Messersmith. Most of his work has been unreported in historical overviews of notation although many of the issues he addresses are of fundamental interest.

The paper reports biographical information, details of his publications and a summary of his doctoral dissertation. It is intended as a contribution to a sociology of knowledge of notation in sport.

2. Biographical Detail

Lloyd Lowell Messersmith was born in Francisco in Gibson County, Indiana on 29 January 1905. He was the first of eight children in his family. He graduated from Francisco High School in 1922 and attended Oakland City College. He taught for two years in a one-room rural school house before he went to DePauw University, Greencastle, Indiana in 1924.

At DePauw he represented the University at basketball, baseball and football. He earned freshman numerals and three varsity letters in each of these sports. He was captain of basketball in his senior year and was selected as an end on the first all state team in football by the *Indianapolis News* in 1927. He damaged his retina in his right eye in a basketball accident in his senior year and was advised to "refrain from all strain and excessive exercise in order to prevent any greater detachment of the retina". When he graduated in 1928 he was awarded the Walker Cup for outstanding performance during his time at DePauw.

After graduation Lloyd received a teaching and coaching position at Shortridge High School in Indianapolis. He taught history and coached basketball at the school for two years. Lloyd also 'moonlighted' by refereeing basketball and football games all over Indiana. Whilst at the school he married Fae Houston in August 1929.

His coaching ability was much respected by his students at Shortridge where he made "a deep impression during his all too brief stay". In 1930 Lloyd returned to DePauw

University as freshman coach and assistant in the department of physical education. In Shortridge's last basketball under his guidance the local newspaper reported that the team:

will be at their best in this game, at the end of their bright career because of their regard for their mentor, Coach Messersmith

On his arrival at DePauw he coached football, basketball and baseball. His position did not attract a high salary and he supplemented his income by officiating at basketball and football games during the Depression years. Many years later his wife wrote of these times:

The pay was \$15 for basketball officials and \$25 for football. The fellowship with other officials was good and the extra money was nice. Fae didn't mind the excited Indiana basketball fans and their boos at the officials as she knew that 'Messer's' decisions were fair; however there were times they hurried away after a game!

Lloyd received a Master's degree from Columbia University in 1932 after four summer terms there.

He taught at DePauw for fifteen years from 1930 to 1945. Towards the end of his time there he was the Acting Director of Athletics. He had a sabbatical year in 1942 to complete his doctoral dissertation at Indiana University. The original title for his dissertation was:

A Study of the Comparative Physical Fatigue Engendered by Participation in a Major Sport - Basketball

but this ultimately became:

The Development of a Measurement Technique for Determining the Distances Traversed by Players in Basketball

During this period of their lives Lloyd and Fae Messersmith had three daughters Ann (b 1935), Jean (b 1937) and Kay (b 1941).

In 1945, Lloyd was offered the position of chairman of physical education at the Southern Methodist University (SMU), Dallas. He remained as chairman for the next 25 years until his retirement in 1970. Throughout this period he taught handball. It is reported that he reserved an 'A' grade for any student that could beat him and that no student had ever gained that grade!

He held a number of offices in physical education associations in Indiana and Texas. In 1961 he received an Honor Fellow award from the American Association for Health, Physical Education and Recreation. In 1969, as part of the centennial celebrations of the game of football, he was chosen as one of DePauw University's twenty-five outstanding players. His hobbies included photography and he was the movie photographer for the SMU Mustang football team for almost three decades.

Throughout his life Lloyd was an active Methodist and was listed in *Who's Who in American Methodism*. He and his family were members of the Highland Park Methodist Church in Dallas. He was a non-smoker and a non-drinker.

He retired from his University post in 1970. All his life he was a physically active person. From 1970 to 1975 he exercised daily and at the age of 70 was still able to do 100 push ups a day! In his more restful moments he particularly enjoyed playing bridge and was described by a friend as "a better partner than opponent".

He suffered a stroke in January 1975. A second stroke resulted in his death on 27 July 1977. At his funeral service a eulogy by his friend Willis Tate, President Emeritus at Southern Methodist University, included the following:

A giant tree has fallen in the forest leaving a wide empty space in the sky. ...

He served by being an example of absolute integrity and fairness...

Lloyd took great satisfaction from being a teacher. His students admired and loved him.

His funeral on 29 July 1977 in Dallas was attended by a large congregation.

3. Publications

Lloyd Messersmith's research publications related to notational analysis appeared between 1931 and 1944. His dissertation, *The Development of a Measurement Technique for Determining the Distances Traversed by Players in Basketball*, was submitted in May 1942 in partial fulfilment of the requirements for the degree of Doctor of Education in the School of Education, Indiana University.

This incandescence of notational analysis was reported in:

Messersmith, L L & Corey, S	(1931)	The Distance Traversed by a Basketball Player, Research Quarterly , II, 2, 57-60.
Messersmith, L L & Fay, P	(1932)	Distances Traversed By Football Players, Research Quarterly , III, 1, 78-80.
Fay, P J & Messersmith, L L	(1938a)	The Effect of Rule Changes Upon the Distance Traversed by Basketball Players, Research Quarterly , IX, 2, 136-137.

- Fay, P J & Messersmith, L L (1938b) The Distance Traversed by College and High School Basketball Players and Effect of Rule Changes upon Distance Traversed in College Games, **Athletic Journal**, XVIII, May, np.
- Messersmith, L L & Bucher, C C (1939) The Distance Traversed by Big Ten Basketball Players, **Research Quarterly**, X, 1, 61-62.
- Messersmith, L L, Laurence, J & Randels, K (1940) A Study of Distances Traversed by College Men and Women in Playing the Game of Basketball, **Research Quarterly**, XI, 3, 30-31.
- Messersmith, L L (1944) A Study of the Distance Traveled By Basketball Players, **Research Quarterly**, 15, 29-37.

In order to stimulate interest in and a reading of the papers I have included here a brief summary of them in relation to: keywords; methods; research design; data collection; validity and reliability; results; recommendations; and references.

Summary of Lloyd Messersmith's Research Reports 1931-1938

Content	Messersmith & Corey (1931)	Messersmith & Fay (1932)	Fay & Messersmith (1938)
Keywords	Distance Traversed Basketball Player	Distances Traversed Football Players	Rule Changes Distance Traversed Basketball Players
Methodology	1. Real-Time Player Track in Game 2. Electric Pursuit Apparatus	1. Real-Time Track in Practice and Game Play 2. Electrical Pursuit Apparatus	1. Real-Time Track in Game Play 2. Electrical Pursuit Apparatus
Sample Size	A trace of the DePauw University floor guard v Miami University (whole game).	Three games (two college and one high school) one player traced in each game analysed. Traced: right half-back; left end; half-back.	Data set of several games played by DePauw University basketball team. Three games reported. Tracks of guard, centre and forward.
Data Collected	1. Student estimates of anticipated distance traversed. 2. Distance traversed noted every two minutes. 3. Recorded changes of possession from defense to offense.	1. Distances traversed in: offense and defense; 'time in' and 'time out'. 2. All four quarters notated.	1. Distance traversed 2. Recorded changes of possession from defense to offense.
Validity/ Reliability	Different observers used pursuit apparatus with "no noticeable difference".	Validated scale measurements of the pursuit apparatus. "any inaccuracy in the results obtained would lie in the inability of the operator to duplicate accurately ... the movements of the player on the football gridiron."	Validated scale measurements of the pursuit apparatus "so any inaccuracy in the result lies in the inability of the operator to follow accurately the movements of the player."
Results	1. Player traversed similar distances first and second half. 2. Traversed approx 608' every two minutes. 3. There were 92 changes of possession in the game. 4. Much greater distances were traversed in attack. 5. The player traversed a distance of 2.34 miles.	1. Distances reported for 3 players in: offense and defense; 'time in' & 'time out'. 2. Activity pattern was comparatively regular during four quarters of play. 3. Additional data presented from other games.	1. Distances traveled consistently greater than in 1931 data. 2. No conclusion about effect of rule changes. 3. Distances traveled were up to 3.97 miles compared to 2.50 miles in 1931.

Summary of Research Reports 1931-1938 (continued)

Content	Messersmith & Corey (1931)	Messersmith & Fay (1932)	Fay & Messersmith (1938)
Other Aspects of Report	Specific footnote about patterns of attack and defense in the game (footnote 2).	No tables of data or reports of practice/scrimmage data	Report intended to explore effects of rule change but seemed vague? Data appears from 1931 that was not reported in 1931 (distance traveled then was 2.34 miles) See
Future Work	1. Modifications to apparatus. 2. Activities in different positions. 3. Football & basketball.	None suggested.	
References	None	One (Messersmith & Corey 1931). Note that Messersmith incorrectly referenced this and cited Corey first.	One (Messersmith & Corey 1931). Note that Messersmith correctly referenced this.
Number of Words	800	950	500
Tables etc	4	0	1

Footnote

The Indianapolis Times carried a report on its sports page on Thursday, 17 February 1938 of the research undertaken for the Fay and Messersmith (1938) paper. The newspaper reports that in a study of four DePauw University players in four different games:

- * the guard in Boston v DePauw game traveled 3.9 miles
- * the forward in Ball State v DePauw game traveled 3.96 miles (12,138 feet in offense and 8.798 feet in defense)
- * the guard in Franklin v DePauw game traveled 3.87 miles
- * the centre in Earlham v DePauw game traveled 3.97 miles

The report concludes with the note that "Prof. Fay follows the player while Prof. Messersmith does the recording and figuring of statistics."

Summary of Research Reports 1939-1944

Content	Messersmith & Bucher (1939)	Messersmith Laurence & Randels (1940)	Messersmith (1944)
Keywords	Distance Traversed Big Ten Basketball Players	Distances Traversed College Men College Women Basketball	Distance Traveled Basketball Players
Methodology	A continuation of earlier studies: real-time player track with electrical pursuit apparatus	A continuation of earlier studies: real-time player track with electrical pursuit apparatus	Development of a measuring device for measurement of distance traversed by individuals. Procedures discussed. Sometimes used three boards at a game.
Sample Size	Three games chosen from several studied during 1938-39 season: Indiana centre (W Menke); Indiana guard (Armstrong); Minnesota guard (Kundla).	DePauw University intra-mural games 1939-1940 season. Twenty games selected at random reported here (10 male and 10 female games)	200 players from variety of ability levels at DePauw University, Indiana University, Greencastle High School. Tracks of players who played whole game.
Data Collected	Distances traversed in offense and defense.	Distances traversed in whole game	Distances traveled per unit of playing time on offense and defense
Validity/Reliability	No explicit discussion	No explicit discussion	Validity of measuring instrument discussed: accuracy checked. Any inaccuracy "due to the inability of the operator to follow accurately the movements of the player under observation." "Errors of over and underestimation probably canceled." Reliability of data discussed. Experimenters trained. Checks at one game gave error between observers of 3.5% but then reports different data?
Results	Distance traversed in offense and defense similar to games at college level but more than high school players. Range of Big Ten Players was 3.46 to 3.89 miles.	Distances traversed by men were approximately twice that traversed by women per unit of playing time.	Discussed in relation to: effect of floor size on distance traversed - a direct influence; effect of rule changes - impact of removal of centre jump. Distances traversed

Summary of Research Reports 1939-1944 (continued)

Content	Messersmith & Bucher (1939)	Messersmith Laurence & Randels (1940)	Messersmith (1944)
Other Aspects of Report	Referred to high school data (1938). Uses three "representative" games for research report. Big Ten are state teams and might thus confuse term "representative".	Discussed potential of 40' x 70' court for intramural basketball	Noted the researcher's role as coach and the pattern of play of team.
Future Work	No discussion	No discussion.	No discussion
References	Three Messersmith & Corey (1931); Fay & Messersmith (1938a); Fay & Messersmith (1938b)	Two Messersmith & Corey (1931); Fay & Messersmith (1938a)	One Messersmith & Corey (1931)
Number of words	400	500	3000
Tables etc	1	1	1 and 1 drawing of apparatus

Footnote

For a photograph of the pursuit apparatus see *The Indianapolis Times* report on its sports page on Thursday, 17 February 1938. Professor Paul Fay is photographed operating the pursuit apparatus and Professor Messersmith noting the distances. His dissertation, *The Development of a Measurement Technique for Determining the Distances Traversed by Players in Basketball* includes a drawing of the apparatus in the appendix.

4. Lloyd Messersmith's Doctor of Education Dissertation

In May 1942, Loyd Mesersmith submitted his dissertation to the School of Education, at Indiana University. Its title was:

The Development Of A Measurement Technique For Determining The Distances Traversed By Players in Basketball

The dissertation has 79 pages, 13 tables and cites eleven references. It is divided into 10 chapters.

In **Chapter I (Introduction)**, Lloyd included the following:

Statement of the Problem

1. The development of a measurement technique for determining the distance traversed by basketball players
2. The application of this device in determining the distances traversed by individuals when playing the game on floors of three different sizes.

Purpose of Study

In addition to 1 above

To ascertain, if possible, the relationship which floor size has upon the distance traversed per unit of playing time.

Delimitations: courts of three sizes were studied:

Size of Court	Players
94' x 50'	College teams in Indiana and the Big Ten Intercollegiate Conference
74' x 50' (regulation size for secondary schools)	'A' & 'B' team players in secondary schools in Indiana; intramural games at secondary school
70' x 40' (size comparable to that use by smaller secondary schools without access to modern gymnasium)	Intramural games at DePauw University (cross court games)

The measuring device used in the study was developed at DePauw University. All data collected in Indiana. The secondary school data were collected mainly from Greencastle. College team data collected either at the DePauw or Indiana Universities.

In his review of **Related Studies** there is reference to: Fullerton (1910) on baseball; Hodgson (1936b) on women's two-court basketball and (1939) on three-court basketball; and Miner et al (1940) on distances traversed in women's basketball. He also cites five of his own research reports (1931, 1932, 1938a, 1939, 1940).

Chapter II reports **the Measuring Instrument** for his study. The electrical pursuit apparatus is described. It was built to scale and was used to trace a player's movements. Observations of players were made from above from "a clear and unobstructed view of the entire playing surface at all times". Nine floors were created - three for each size of basketball court to be studied. It was described by Lloyd Messersmith as a compact, portable piece of equipment. Sometimes it was placed on a table in the press box and at other times on the observer's knees with the batteries between his feet! An assistant recorded data from an impulse counter.

The **validity of instrument** was tested. Measurements of known distances on the courts were checked. For short distances measurements were reported to be exact but for longer distances there was some variance. A measurement of 300 excursions up and down 94' court produced a result 1.75% less than the actual distance (6.29 miles rather than 6.40 miles) but the apparatus consistently measured known distance thus:

any inaccuracy in the results obtained was due to the inability of the operator to follow accurately the movements of the player under observation. Errors of over and underestimation probably canceled so that the final result was, in all probability, a reasonably accurate record of the actual distance traversed.

The **reliability of data** collected was discussed. Experimenters were trained to secure reasonable uniformity in technique in handling the tracing wheel. Differences between experimenters tracing same player were approximately 3%.

Game	Operator A	Operator B	Difference
1	3.20 miles	3.25 miles	1.56%
2	3.10 miles	3.22 miles	3.87%
3	3.26 miles	3.32 miles	1.84%

Lloyd Messersmith reported the **procedure in collecting data**. If the player tracked was substituted the track continued with the substituted player. Data collection focused on playing positions and those players who were on court for whole game. "In a large number of cases the player under observation did play the entire game."

There were two operators at each data collection event: a tracer and a recorder. An apparatus illustration and a tally sheet were included as appendices to dissertation.

Data collection started in 1931 but the majority of material covering secondary school and intramural players was collected 1938-1941.

With regard to the **applicability of the measuring instrument to other sports** it was noted that the pursuit apparatus was applicable to a range of sports and had been used in football (Messersmith and Fay, 1932).

Chapter III reported **the Distance Traversed By Players On College Teams**. Data were collected on 57 college positions in Indiana Intercollegiate Conference (data collected at DePauw University) and the Big Ten Intercollegiate Conference (data collected at Indiana University). Lloyd Messersmith regarded this as a fair sampling of the type of game played by representative college teams in the United States of America and represented "a typical basketball situation as could be found in any section of the country". Twenty-five of these 57 played entire games.

Data were collected over a decade from 1931 to 1941. Distances traversed ranged from 2.12 miles to 4.22 miles per game with a mean distance of 3.38 miles for 57 positions included in the study.

	Centre	Guard	Forward
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Average distance traveled per game	3.44 miles	3.33 miles	3.28 miles
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All positions travel approximately equal distances. There appeared to be no difference in the distances traversed by Big Ten players compared to teams in Indiana Conference.

The introduction of a '10 second rule' and the elimination of the centre jump appear to have increased distances traveled by approximately a mile during the course of the study. The removal of the centre jump after a basket was scored increased actual playing time and speeded up the game in majority of cases.

Lloyd Messersmith also collected information about distances traversed in offense and defense. Of the 57 positions observed the average distance in offense was 9,043.41 feet and in defense 8,810.38 feet.

With regard to change of possession it was noted that: Big Ten averaged 3.3 per minute, Indiana Conference 4 per minute. The removal of centre jump made it mandatory to change possession and thus the 75 pre-rule change became approximately 130 post-rule change.

Of the 25 out of 57 who played whole games: distances traversed ranged from 4.23 to 3.15 miles per game (mean 3.40). Players of whole game traveled as far as those sharing a positional responsibility.

The distances traversed in final quarter were greater than in previous quarters and Lloyd Messersmith noted that:

The distance traversed in any segment of the game appeared to be a function of the score and style of game employed by the competing teams rather than the physical condition of the players.

Chapter IV discussed **the Distance Traversed By Players On Secondary School 'A' Teams**. Data were reported from games on courts 74' x 50'. In all 63 positions were traced. Distances traversed ranged from 1.79 miles to 2.88 miles.

Chapter V discussed **the Distance Traversed By Players On Secondary School 'B' Teams**. 32 players were observed.

Chapter VI discussed **the Distance Traversed By Players On College Intramural Teams**. 42 players were studied on a court 70' x 40'.

In **Chapter VII** Lloyd Messersmith discussed **the Relationship Between the Size of Playing Floor and Distance Traversed**. It was concluded that the size of the court has a direct bearing on distances traversed:

Size of Court	Average Distance Traveled
94' x 50'	441.86 feet per minute

74' x 50'	404.63 feet per minute
70' x 40'	345.92 feet per minute

In **Chapter VIII** it was noted that there was no significant difference in the distances traversed in relation to **the Effect of Position Played Upon Distance Traversed**. Big Ten players traveled furthest at an average of 3.34 miles per game.

Chapter IX discussed **the Effect of Certain Rule Changes Upon Distance Traversed**.

In **Chapter X** a number of **Conclusions and Recommendations** were made. It was concluded that:

1. Individuals in good physical condition are able to play a complete game of basketball without noticeable signs of physical strain.
2. Distance traversed were a function of style of game employed and floor area.
3. All players on a modern basketball team travel approximately equal distances.
4. Rule changes increased activity as measured by distances by approx 50%.
5. College A and B teams less cautious in ball handling than Big Ten teams.

Most of the recommendations were game focused but also included a link between distances traversed and muscular strength. It was suggested that consideration should be given to energy requirements in the game.

5. Publications by Lloyd Messersmith's Contemporaries

Lloyd Messersmith's dissertation cites 11 references: five of these are to his own work. The remainder are:

- | | | |
|--|---------|--|
| Blake, R | (1941) | The Distance Traversed by Basketball Players in Different Types of Defense, Athletic Journal , XXI, January, 18-20. |
| Fullerton, H | (1910) | The Inside Game: The Science of Baseball, The American Magazine , LXX, 1, 3-13 |
| Hodgson, P
Certain
Activity, | (1936a) | Studies in the Physiology of Activity: I. On Reactions of College Women to Measured
Research Quarterly , VII, 1, 3-25 |
| Hodgson, P
Certain | (1936b) | Studies in the Physiology of Activity: II. On Reactions of College Women Following Participation in Two-Court Basketball,
Research Quarterly , VII, 2, 45-55 |
| Hodgson, P | (1939) | Studies in the Physiology of Activity: II. On Certain Reactions of College Women Following Participation in Three-Court Basketball,
Research Quarterly , X, 1, 53-60 |
| Miner, N, Hodgson, P
Espenschade, A | (1940) | Study of Distance Traversed and Time Spent in Active Play in Women's Basketball,
Research Quarterly , XI, 1, 95-101 |

In order to get a sense of the range of literature available these references (with the exception of Blake (1941)) were examined.

The references cited by Lloyd Messersmith's contemporaries:

Hugh **Fullerton** (1910) does not cite any other sources. Pauline **Hodgson (1936a)** **cites 21 references** from physiology texts. She cites **6 references in (1936b)** - one to 1936a, one to unpublished data prepared by A Espenschade, J Falconer and N Miner in 1935 and four physiology texts. **Her (1939) paper cites one reference** - her (1936b) paper.

Nancy **Miner et al (1940)** **cite three references**: Hodgson (1936b, 1939) and a psychology text.

What is interesting in this cluster of research is that two research groups appear to have been working in the study of distances traversed. Lloyd Messersmith and his co-workers did not refer to Pauline Hodgson and her co workers. Nor did they refer to Lloyd Messersmith. Both groups used the *Research Quarterly* of the American Association for Health, Physical Education and Recreation as the prime vehicle for sharing their research reports.

6. Conclusion

Lloyd Messersmith's work in the notational analysis of sport has received comparatively little attention. The purpose of this paper has been to bring his work to the attention of a wider audience and to stimulate interest in the forging of ideas about notational analysis. In doing so I have sought to link his academic endeavour to a biographical context. Such an approach emphasises the personal construction of knowledge in notation and the gains to be made from retrospective study.