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Zásady pro vypracování:

V úvodu práce budou na základě dostupné literatury definovány jednotlivé textové vzorce včetně jejich částí a budou popsány možnosti jejich lexikální signalizace. Dále budou nastíněny obecné charakteristiky populárně vědeckých článků jako žánru. V analytické části pak bude zkoumán výskyt textových vzorců a jejich signalizace v populárně vědeckých zprávách. Na závěr autorka shrne výsledky analýzy a pokusí se je vztáhnout k charakteristikám zkoumaného žánru.

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Souhlasím s prezenčním zpřístupněním své práce v Univerzitní knihovně.

V Ústí nad Orlicí dne 20. 3. 2010

Tereza Stejskalov

Annotation: An attempt is made in this work is to define the Lexical signals in generic structure of popular scientific reports (PSR). Theoretical part is mainly concerned with the definition of a genre and the generic structure, considered as a major representative of the purpose of genre. In the practical part 35 popularise articles randomly chosen in internet were examined using the Nwogu's structure (1991), since his work, to my knowledge, is the only one dealing with the genre of the Science Popularization. The results obtained from this analysis indicate that PSRs have a schema by which the information in PSR is organized. The schema is made up by eight schematic structures called "moves". In the PSR each move fulfils a concrete purpose and also contains "Constituent Elements ". In this work the constituent element is referring to the lexical signal, i.e. the most frequent lexical word in a concrete move of an article. The function of the lexical signal is based on the purpose of a concrete move, in which the lexical signal is occurring.

KEYWORDS

genre; generic structure; move; science popularization; lexical signals

Souhrn: Hlavním cílem této práce je určit Lexikální signály v žánrové struktuře populárně vědeckých zpráv. Teoretická část je především zaměřena na definici žánru a na definici žánrové struktury. V praktické části je analyzováno 35 populárně vědeckých zpráv náhodně vybraných z internetu dle struktury Nwogu (1991), neboť jeho práce, pokud vím, je jediná, která se zabývá problematikou populárně vědeckých zpráv. Výsledky získané z analýzy naznačují, že populárně vědecké zprávy mají schéma, podle kterého jsou informace v textu těchto zpráv uspořádány. Schéma je tvořeno osmi menšími částmi textu označené "moves". Každá tato část plní v textu populárně vědeckých zpráv svůj určitý účel a obsahuje pro ni charakteristické prvky. V této studii jsou za charakteristické prvky považovány lexikální signály, tj. lexikální slova, která se v dané "move" vyskytují často a vzhledem k ní plní určitý účel.

KLÍČOVÁ SLOVA

žánr; žánrová struktura; move; populární věda; lexikální signál

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1 Introduction

The rapid increase of scientific news in the past few years is associated with the expansion of popular magazines and newspapers. It can also be also influenced by the fact that these days science plays a very visible and important role in modern society. A special kind of interaction exists between the world of science and the world of media, however, this interaction is quite complicated. It is because the world of science and the world of media differ in a way of developing their own realities.

The main goal of my bachelor thesis is to identify lexical signals in the generic structure of popular scientific reports (PSR). Therefore, one important concept in this work is the concept of genre which is discussed in the first section of the theoretical part. This section also provides information about the three different views of the genre studies based on the Rhetoric Genre Studies, Systemic Functional Linguistics (SFL) and English for Specific Purposes (ESP), and also about two essential characteristics of the genre: purpose and structure.

The following section focuses on the genre of Science Popularization and the definition of popular scientific reports. Since this study is based on the Nwogu's structure of Science popularization - to my knowledge, his work is the only one dealing with the generic structure of popular scientific reports (PSRs) - the following section is concerned with the description of Nwogu's structure to underline its significance in this concrete area. The last section of the theoretical part introduces the modified structure used in this study and provides descriptions of smaller parts called "moves" organizing the structure of PSRs.

The practical part deals with the analysis of generic structure in popular scientific articles which is supposed to be the first essential step in identifying the lexical signals, i.e. to identify the most frequent lexical word in a concrete part of an article. The second essential step in identifying the lexical signals is concerned with defining of the purposes of moves - smaller parts of a text - making the structure of PSRs. After realizing these two essential steps the analysis of the lexical signals is possible. Therefore, the practical part provides detailed information about the characteristics (i.e. purpose) of each move in organizing the information in PSRs. However, the most important information presented in this part, viewed as the main aim

of my study, is related to the identified lexical signals and their functions based on the purpose of a concrete move. The last section of the practical part introduces the results obtained in the study and also presents the study's conclusion.

The motivation for this study is my personal interest in linguistic studies. Moreover, a little attention has been paid to the genre of the Science Popularization. Therefore, I consider this work very interesting and meaningful and also as a challenge in the field of linguistics.

2 Genre

2.1 The most influential definitions of genre

Genre has been defined according to different views in regards to the field of applied linguistics. The three different traditions of genre studies such as the rhetoric genre studies, systemic functional linguistics (SFL) and English for Specific Purposes (ESP) created the most influential definitions.

The first definition is from the rhetoric genre studies. Miller asserts that genre is rhetorical action based on recurrent situations and that genre classification is based on rhetorical practice, rather than based only on structure, substance, or aim. Genre studies in the new rhetoric are more focused on relations between text and context and less on features of the text.

The second definition of genre comes from the perspective of systemic functional linguistics (SFL) and was proposed by Martin. Martin reflects genre as a goal-orientated aspect of the text. Speakers have different types of purpose when engaging in conversation, spoken or written. For an efficient achievement of these goals, the texts are usually developed in a certain way: "genre theory suggests that texts which are doing different jobs in the culture will unfold in different ways, working through different stages or steps" (Taboada 2004:25).

The third definition is from the view of English for Specific Purposes (ESP) proposed by Swales. Swales defined genre as follows:

> A genre comprises a class of communicative events, the members of which share some set of communicative purposes. These purposes are recognized by the expert members of the parent discourse community, and thereby constitute the rationale for the genre. This rationale shapes the schematic structure of the discourse and influences and constrains choice of content and style. (1990:58)

2.2 Genre in general

Generally, it can be said that the genre is a type of social activity performed by means of language and which is characterised by two essential aspects: purpose and structure. The purpose of genre in this context means how people use language to achieve culturally appropriate goals (Zabala, 2007:133). The structure of genre is determined by

the communicative purpose or social function of a genre in terms of smaller parts called "moves" by Swales.

2.2.1 Generic structure

On the basis of Swales' definition, which I have adopted as a general definition of a genre and introduced above, the structure of text is made up by a series of moves. Furthermore, every move is characterised by its own specific purpose, which is reflected in a subject matter of each move and its constituent elements. For that reason, the generic structure is considered to be one of the major representatives of the purpose of genre.

As this work focuses on the genre of Science Popularization, the following sections are devoted to this topic.

3 Science popularization

The existence of Science Popularization is described as a consequence of the expansion of magazines and newspapers. Along with the rise of Popular Scientific Reports (PSRs) it is also connected to the emergence of a new group of professionals, referred to as the group of "the entrepreneurs of science," whose primary function is to popularize science to the public.

Two relevant aspects can be taken into account in terms of a classification of popular scientific articles. Firstly, popular scientific articles may be divided according to the type of medial channel in which the PSRs are popularized: printed media as magazines and newspapers; and electronic media such as radio and television. The second possible aspect for classification can be the status of writers: science researchers popularizing their works or "entrepreneurs of science" (Nwogu, 1991:112 -113).

3.1 Definition of the Genre of Popular Scientific Report (PSR)

As a definition of popular scientific articles I have adopted the definition of Haupt who dealt with this type of genre under his dissertation project called "Contrastive Coherence Relations in Popular Scientific Reports'. He defined the genre of popular scientific reports as:

" […] a genre whose purpose is to inform non-specialist readers about a recent scientific finding in a brief, interesting, celebratory and (relatively) balanced manner." (Haupt, unpublished notes)

In his definition of popular scientific reports, Haupt wanted to underline the fact that popular scientific reports are not identified as a social interaction, as in interactional genres defined by Brown (Haupt, unpublished notes), but as a transactional genre with the main purpose to transmit information. The essential feature of genre is supposed to be the type of transmitted information and in the PSRs the transmitted information is determined as information concerned with the recent scientific findings.

The main goal of popular scientific articles is to introduce recent scientific findings and their possible implications to non-specialist readers. It also indicates previous studies related to the research being reported, describes concrete methods used during the research, introduces the particular discoverers and sometimes can also deal

with different types of limitations in a particular study. All these facts involved in the popular scientific reports are presented to a potential non-specialist audience in an interesting and celebratory way, rather than in a validating way. It is due to the fact that popular scientific accommodations are incredibly impressive (Fahnestock, 1986:20). For this reason, language used in popular scientific articles should be easily understandable and not too complicated for non-specialist audience.

To summarise, all these facts support the idea that the definition of popular scientific reports formed by Haupt is very accurate and help to better understand the purpose and the generic structure of the genre of Science Popularization.

As previously stated in part 1, one of the major representatives of the purpose of genre is its generic structure. The generic structure of the genre of Science Popularization is discussed in the following section.

3.2 Structure of popular scientific articles (PSR)

Based on the material I have used in my work, only one study exists that deals with the generic structure of PSRs. This study was carried out by Nwogu who based it on one type of scientific popularization, on the Popularized Medical text. In this work Nwogu identified nine moves that made up the structure of a Popularized Medical text and, in addition, each of them fulfilled its particular purpose. This purpose influenced the content of each move and also its constituent elements, for example **lexical signals**. In addition to this, he also determined the typical ordering of these nine moves in the Popularized Medical text. Further details are introduces in the following section.

4 Nwogu's structure of Science Popularization

Since my analysis is based on Nwogu's structure of Science Popularization, focused on the structure of Popularized Medical texts, it would be inappropriate not to mention this.

4.1 Introduction of Nwogu's study

The main purpose of Nwogu's study was to characterize the patterns of discourse organisation of text falling within Medical Popularization. More accurately, the study was concerned with the popularized medical text "referred to as "Journalistic Reported Version" (JRV) of professional medical research reports" (Nwogu, 1991:112). The work consisted of examining 15 articles from the field of medicine which were selected from popular science magazines: *The NewScientist, The Times* and *Newsweek.*

Nwogu decided to form the structure of these research papers on the basis of Swales' model for analysis of genre, however, his idea was not to make a kind of replica of Swales' work, his focus was to provide new information based on Swales' theory of "moves". Nwogu in his study clarified the term "move" as follows:

> By the term "move" is meant a text segment made up of a bundle of linguistic features (lexical meanings, propositional meanings, illocutionary forces, etc.) which gave the segment a uniform orientation and signal the content of discourse in it. Each "move" is taken to embody a number of "Constituent Elements" […]. (Nwogu, 1991:114)

Moreover, according to him each move involves 'Constituent Elements' that are used to introduce information in the move. In my work these constituent elements are referred to as **lexical signals.**

The results obtained in Nwogu's study play a very significant role in terms of Science Popularization. Therefore, another section is dedicated them.

4.2 The results of Nwogu's study

At first he was concerned with the ordering of moves. On the basis of his analysis he found out that the most JVR texts contain the following types of information:

1. A brief statement which functions to provide some background to the problem.
2. An indication of the main research problem.

3. An indication of the limitations of previous efforts at resolving the problem (this information is contained in very few texts).
4. An indication of the researchers who conducted the study and what they set out to achieve.
5. An indication of some of the positive results obtained.
6. An indication of some of the methods used in the collection of data.
7. A description of the methods used in the experiments.
8. Some discussions and explanations of specific research outcomes.
9. A statement of the main conclusions of the research report and its implications to the target audience.

These findings enabled him to focus his analysis on the 'moves'. Nwogu claimed that the organization of typical JVR text is based on the following "moves":

Move one: Presenting Background Information
Move two: Highlighting Overall Research Outcome
Move three: Reviewing Related Research
Move four: Presenting New Research
Move five: Indicating Consistent Observations
Move six: Describing Data Collection Procedure
Move seven: Describing Experimental Procedure
Move eight: Explaining Research Outcome
Move nine: Stating Research Conclusions

According to Nwogu there exists a schema for popularized scientific texts. But, he also concluded that this schema is not fixed and its variations are possible (Nwogu, 1991: 115-116).

As I have previously mentioned, the structure of popular scientific reports used in this study is based on the Nwogu's structure, since, to my knowledge, his study is the only one that deals with the generic structure of Science Popularization. For that reason, the structure of PSRs seems to be very similar to the Nwogu's structure. However, several alternations were needed to make. The Modified structure used during the analysis of **lexical signals** is introduced in the following section.

5 The Modified Structure of Popular Scientific Articles

5.1 Methodological framework

According to lexicology, words are divided into two basic groups: Lexical words involving nouns, adjectives, adverbs and Function words involving pronouns, numerals, prepositions, conjunctions. Under this study I decided to deal only with lexical words: nouns, adjectives, adverbs, verbs and also with contrastive conjunctions for their special function to connect two contrastive statements. The decision not to deal with the both word groups was influenced by the fact that it would be very complicated and beyond the scope of this work. Because of this, the possibility of a future study has been proposed.

Clarification of the process of analyzing moves and counting the specific words is also needed. The process of counting lexemes was a little bit complicated. Since one identical lexeme very often occurs several times in the content of one move, all word forms of this identical lexeme were considered as one occurrence of this lexeme.

For analyzing each move in 35 PSRs a table was always created including three types of basic information: the number of an analyzed article, the specific lexeme thought to be a characteristic feature of a particular move and the ordinal number of this word. If the lexeme occurred in almost one-third of identified moves - in one PSR certain moves may occur several times - its final ordinal number was marked with a green colour and the words are considered as the **lexical signal**. If the lexeme occurred in less than one third of identified moves, its final ordinal number was marked with yellow colour. The words that occurred only once are without ordinal number. All these tables are enclosed in the appendix.

The **lexical signal** in this work refers to a lexical word whose occurrence is very frequent in a concrete move. For that reason this lexeme is viewed as the constituent element of a certain move. Furthermore, the function of a lexical signal as well as the frequent occurrence of it in a particular move is mainly influenced by the functional criteria of that move, such as its **purpose**. The purposes of all eight moves defined in the study are discussed in following section.

5.2 Description of moves

During his study, Nwogu defined nine possible 'moves' that organize information in a typical JRV text. On the basis of my analysis of PSRs only eight moves were identified.

On the basis of the analysis used within this study the information in a text of the popular scientific articles is organised according to the following moves:

Move 1: Purpose - to present the background of the research

Move 2: Purpose - to announce the main outcomes of the research

Move 3: a) Move 3 larger context:

Purpose - to provide general knowledge about the studied issue or fill the gaps in knowledge

b) Move 3 limitation of on-going or previous research:

Purpose - to inform about the limitations of the on-going research or previous studies

c) Move 3 previous research:

Purpose - to provide information about the related previous studies

Move 4: Purpose - to present new research and to explain the purpose of the research

Move 5: Purpose - to indicate research results in detail

Move 6: Purpose - to describe data collection procedures

Move 7: Purpose - to indicate the main research outcomes and to provide their description and explanation

Move 8: Purpose - to provide research conclusions and future implications of the research results

5.2.1 Move 1

Move 1 is very often the initial move of PSR (Popular Scientific Report). But its presence in the PSR is not obligatory or necessary.

Move 1 is usually short statement about one sentence in length and commonly occurs only once in the structure of the PSR.

The main function of Move 1 is to provide background information about the topic of discourse by presenting knowledge which in the context of the research can be regarded as holding true for a long period of time.

According to the analysis this move does not have specific lexical signals, therefore the table of analysis for Move 1 was not created. But, because the purpose of Move 1 is to present knowledge regarded as holding true for a long period of time, it very often uses simple present tense. That is characterised by:

Blue is sometimes not an easy colour to make. (n.28)

5.2.2 Move 2

Move 2 is quite important because it announces the main outcomes of the research being popularized. The main purpose of Move 2 is to introduce the most important outcome of the research as well as to bring background information about the topic of discourse. Therefore, it can provide these types of information: about the people involved in research, what was discovered, found, created etc., what type of benefit this research brings.

Move 2 occurs almost always in PSR and very often possesses the form of a brief statement, usually about one or two sentences in length, that is:

A new study finds that, in the first few days of life babies produce cries that mimic the melodies of their native language. (n.12)

5.2.3 Move 3

According to Nwogu, this move informs us only of studies related to the research being reported and mainly about their limitations.

Based on my analysis Move 3 is divided into 3 different moves:

1. Move 3 larger context,
2. Move 3 limitation of previous study or on - going study
3. Move 3 previous study.

Each of them has its own purpose and for each move typical lexemes were found. Generally, however, Move 3 provides the information necessary for evaluating the contribution of the research in the concrete field.

1. Move 3 larger context

Move 3 larger context contains information, which gives us general knowledge about a studied issue. It can also contain new information that deepens the knowledge of a

potential reader in the concrete field. For this, Move 3 larger context helps to the reader to better understand the importance of the study.

As Move 3 larger context introduces general knowledge, present tense is used the most. In addition, passive voice, commonly used in academic prose, very often occurs here. Its function is to express logical relations. That is realized by:

Valproic acid is an inhibitor of the enzyme hystone deacetylase located at the cell nucleus where the DNA is found. (n.3)

2. Move 3 limitation of on-going or previous research

The main purpose of this move is to inform about the limitations of a research. It can contain details about the possible problems, unexpected failures in the research, the inabilities to overcome any kind of difficulty, the absence of the elements that are important for research progress and the struggles with unclear aspects of a research. Therefore, the use of grammatical negation as well as lexical negation is very common in this move.

Moreover, this move is divided into two types. One type of the move provides information about the limitations of an on-going research and the second type of move informs about the limitations of a previous research. That is realized by:

a) on-going: *…deficits, but the mechanisms by which the sleep deprivation affects brain function remain unknown.* (n.4)

b) previous: *Results from a 2002 … However, most children´s symptoms returned when the medication was discontinued…* (n.24)

3. Move 3 previous research

The main purpose of Move 3 previous research is to provide information about previous studies related to the research being popularized. It may announce details of earlier outcomes or introduce the first idea of what the experts wanted to discover. It can also describe procedures of a previous research. That may be realized by:

Scientists stumbled upon the Ardipithecus fossil in 1994 when graduate student found a single upper molar tooth … (n.1)

This move is not very common and not many PSRs contain it.

5.2.4 Move 4

To present new research and to explain the purpose of the research are the basic functions of Move 4. Furthermore, this move can indicate the actual researchers who conducted the study.

The most common information involved in Move 4 is about the publication of research results. Move 4 may also provide information about the implications of the results or about the methods used to collect data. For that reason it can be said that Move 4 is a kind of brief introduction of the research. It indicates a topic, describes the process of research and gives the readers an idea of what the rest of the PSR will say.

Move 4 very often informs only about possible publication of the research results. In this situation it is only about one sentence in length, that is realized by:

> *Results will be published in the February 2010 issue of Alcoholism: Clinical & Experimental Research.* (n.26)

This concrete fact is not included in the description of Move 4 in Nwogu's structure.

5.2.5 Move 5

Move 5 is primarily concerned with the main outcomes of the research. For instance, it involves details about the specific observations, it can also introduce interesting data gained from the procedures of data collection in a study, and it can also deal with the implications of a concrete invention. Therefore, Move 5 can be seen as the first attempt to report the important results of the research being popularized.

Another comment on Move 5 is regarding its position. Since Move 5 is the first attempt to report the main research outcomes, it usually stands before Move 7. Move 7 also provides information about the research results but further underlines their significances. Move 7 is discussed later in this chapter.

5.2.6 Move 6

The main purpose of Move 6 is to introduce the methods used during the research being reported. It provides a detailed discussion concerning the process of data identification, selection and delimitation as well as the procedure for experimentation. Therefore, it provides information about the technology, tools and techniques used during the study and it can also provide information about the subjects being examined.

The position of Move 6 is not fixed. However, Move 6 never occurs below the picture involved in the PSR and very often follows Move 5.

In the structure of Nwogu the move dealing with the methods used in the research is divided into two different moves, into Move 6 and Move 7. Nwogu took account of the difference between the description of Data Collection Procedures referring to Move 6, for example to ask several people to do any kind of activity, and description of the Experimental Procedures taking place in laboratory, referring to Move 7. During the analysis of these two moves there was no marked diversity found in terms of the lexical signals, therefore they were linked together under this study.

5.2.7 Move 7

Move 7 is primarily concerned with descriptions of the research outcomes. It presents details about the main observations made in a study and indicates their significance. It can also interpret, justify and contrast them with similar observations made in related studies. In the process of indicating significance of the main research outcomes, the writer of PSR uses two ways of stating it. One way can be compared to "deduction" of the results, as is illustrated by the following example:

> *In fact, what Ardipithecus tells us is that we as a human have been evolving to what we are today...* (n.1)

The other way can be seen as a kind of "celebration" of the main results, as is demonstrated by the following example:

> " *This is the first empirical demonstration that, … people are able to recognize meaning in a language they don't speak," said Gregory ...* (n. 9)

Nwogu's structure does not deal with these two different ways of introducing the significances of the main research results.

Move 7 can also provide an explanation of the principles of the results. It can also present comments underlying the observations made during the research or comments of the researchers themselves as well as those of other researchers on the obtained results.

The fact that Move 7 occurs in every popular scientific article is not surprising, because it contains important information dealing with the main outcomes of a study.

Move 7 does not have a fixed position in the PSRs. But, as has already been said in the description of Move 5, Move 7 usually stands after Move 5. It is due to the fact, that Move 5 is the first move reporting the main research outcomes.

5.2.8 Move 8

Move 8 is usually the last move in the popular scientific reports. Although during the analysis its occurrence in the middle or almost at the end of a PSR was also observed, for example in article 1 it occurs in the middle, in article 10 it occurs almost at the end.

Move 8 can state contributions which the study has made to the field. It can also introduce possible implications of the research results, suggest the need for further studies or it may present the aim of future studies. It can be realized by:

> *"We hope this new understanding will one day provide us with strategies to delay or even prevent, the development of Parkinson's disease."* (n.5)

Based on the analysis, Move 8 does not always occur in the popular scientific articles. This fact is surprising, since its main function is to provide research conclusions and future implications of the research results

To create the structure of popular scientific reports and to define the purposes of moves were considered as the essential steps to the analysis of the lexical signals in each move involved in the popular scientific articles. The following practical part introduces the outcomes of the analysis.

6 Analysis of the Lexical signals in PSR

the Corpus

All popular scientific articles contain only the text analyzed and were examined in detail to see if they follow features defined in the part 5.2. Special attention was focused on constituent elements referring to **the lexical signals** in a particular move.

As was said in the part 5.2.1, during the analysis of Move 1 there were not found any lexical signals. Therefore, Move 1 is not included in this part.

My study is not focused on one specific field, which is in contrast with the work of Nwogu who concentrated his study only on Popularized Medical text, and does not deal only with one particular type of journal. Therefore, the work is based on the analysis of 35 popular scientific articles randomly collected from different fields and from 15 different sources: BBC, CNN, The New York Times, ScienceDaily, ScienceNews, EurekAlert, Nationalgeographic, Livescience, ScienceNow, SFGate, Yahoo News, Scientific Blogging, ABC Science, NewsScientist, Science A GoGo.

6.1 The lexical signals of Move 2

The occurrences of the lexical signals of Move 2 observed in the study are provided in the Table 1. The comments on each lexical signal follow.

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb +synonyms, hyponyms : find	26	noun + synonyms : study	13
noun + its synonyms, hyponyms : researcher	25	adjective: new	12

table 1: the lexical signals in Move 2

6.1.1 Comments on defined lexical signals

1. the lexical verb: *find* and its synonyms and hyponyms
   synonyms: discover, unearth,
   hyponyms: offer, make, create, show, suggest, prompt, hint, claim, develop

The lexical verb *find* and its hyponyms and synonyms express the main activities of the scientists. The primary purpose of the research is through the use of examining procedures to find or develop any kind of beneficial thing or solve any type of difficulty

thought to be an influential problem for progress in a particular study. Therefore, this lexeme and its defined synonyms and hyponyms indicate a successful fulfilment of the main purpose of a research, i.e. the words convey the message about the concrete success achieved during the procedures of an examination. That is realized by:

People … who have mutant version … may be at higher risk of developing Parkinson's disease, two large teams of researchers have founded. (n.5)

2. the noun (pl.).: researchers and its hyponyms and synonyms
   synonym: scientist
   hyponyms : paleontologists, biologists, astronauts, chemist, team, colleague

In Move 2 the noun *researchers* refers to the persons dealing with an item of a particular research and doing the main activity such as testing, observing, examining, etc. during a research being popularized.

In terms of the syntax, the basic structure of the English sentence is SVOMPT. Move 2 in PSRs is usually about one or two sentences in length and its S is most commonly presented by the noun *researchers* or its defined hyponyms and synonyms.

During the analysis it was observed that the noun *researcher* and its defined synonyms referring to the persons dealing with the subject of a particular research occur very often in plural, that is:

The oldest known hominid skeleton … offers new clues to how human may have evolved, scientists say. (n.1)

It may be because the scientific work is usually the work of a group of experts.

3. noun (sg.): study and its synonyms
   synonyms such as: research, experiment, work

The noun *study* and its defined synonyms refer to the main activities of gaining knowledge by examining a particular subject or puzzling question in detail.

During the analysis of Move 2 it was observed that the noun *study* and its defined hyponyms, synonyms are always in singular. It is due to the fact that in Move 2 the PSR writers introduce overall outcomes of a one particular study, concretely the study being reported. For better understanding the example follows:

A new study offers a tip for learning to recognize unfamiliar dialects … (n.20)

4. the adjective: new

In Move 2 the main function of the adjective *new* is to indicate that a discovered fact was not known about before. It can also indicate that a particular study is different from the previous studies dealing with the same puzzling item as a study being reported. Both uses of the occurrence of the adjective *new* are illustrated by the following examples:

a) different study: *We not only hear with our ears, but also through our skin, according to a new study.* (n.18)

b) recent discovery: *European astronomers have found 32 new planets…* (n.2)

Since Move 2 usually reports what the scientists have discovered, developed, etc. it introduces a relevant change in the concrete field of science. It can also inform about a possible contribution which the study has made to the field of science.

To sum up all these observations, the main purpose of Move 2 can be defined as follows: to announce the main outcomes of the research being popularized.

6.2 The lexical signals of Move 3 larger context

The lexical signals of Move 3 larger context observed in the study are provided in the table 2 The comments on each identified lexical signals follow.

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb + synonyms : call	8	lexical verb + synonyms: say	8

table 2: the lexical signals in Move 3 larger context

6.2.1 Comments on defined lexical signals

1. lexical verb: call and its synonyms
   synonyms: name, refer

To give a particular subject a particular name is the primary function of the lexical verb *call* and its hyponyms and synonyms.

Since the main purpose of Move 3 larger context is to provide general knowledge about the studied issue or fill the gaps in knowledge of a potential reader,

the lexical verb *call* and its defined synonyms and hyponyms in this move give a particular name to inanimate subjects, not to the persons, that is realized by:

... The enzyme, called HDAC (Histone deacetylase) belongs to a group ... (n.14)

2. the lexical verb: say and its defined synonym
   synonym: note

Lexical verb *say* and its synonyms fall within the group of verbs called "communication verbs" and are most commonly used in reported speech.

Because the purpose of Move 3 larger context is to provide general knowledge about the studied issue, reported speech involved in this move usually contains statements dealing with common facts related to a studied issue, that is realized by:

"Children with FASD have learning difficulties with reading, memory, executive functioning ...," said Christian Beaulieu ... (n.26)

According to the analysis, Move 3 larger context contains information which gives us general knowledge about the studied issue. It can also contain new information that deepens the knowledge of a potential reader.

Therefore, the main purpose of Move 3 larger context is defined as follows: to provide general knowledge about the studied issue or fill the gaps in knowledge.

6.3 The lexical signals of the Move 3 limitation

The occurrence of the lexical signals of Move 3 limitation observed in the study are provided in the table 3. The comments on the lexical signals follow.

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
contrastive conjunctions: but, although, however	17	noun (sg./pl.) +synonyms, hyponyms: scientist	10
the adverb: not	13	lexical verb + synonyms: say	9

table 3: the lexical signals in Move 3 limitation

6.3.1 Comments on defined lexical signals

1. contrastive conjunctions: but, although, however

The common function of contrastive conjunctions is to link two statements that are in contrast or to introduce a statement that shows surprise, annoyance or disagreement.

Move 3 limitation very often states negative reaction on the preceded idea introduced in different type of move. Based on the analysis, the preceded move is usually Move 7. For better understanding the example is illustrated:

M7 *... subtitles appear to have helped the participants to decipher ... This did not, however, allow participants to retune ...* M3 limitation (n.8)

Move 3 limitation also uses contrastive conjunction to hint that one statement seems to be unexpected and alarming in relation to another statement. In this situation the both ideas fall within one Move 3, as can be seen in the following example:

Results ... showed that antipsychotic medication risperidone reduced such behavioural problems ... <u>However,</u> most children's symptoms returned (n.24)

2. adverb: <u>not</u>

Lexical verbs are negated by the use of operator: *be, do,* or *have* which is followed by the adverb *not*, for example: *didn´t* connect, *have not* known, *is not* known. This type of negation is called 'grammatical negation' and it gives negative meaning to the word or to the whole phrase.

Because the main purpose of Move 3 limitation is to inform about the limitations of a concrete research, the frequent use of grammatical negation is not surprising. It is realized by:

"At the moment, <u>it's not possible to treat</u> preterm labour effectively…" (n.35)

During the analysis of Move 3 limitation it was found out that the lexical negation, which is another option for making the negative meaning of words or phrases, also occurs very often in Move 3 limitation. This type of negation is a part of the lexical meaning and is created through the use of appropriate negative prefix, such as *un-, dis-, in-, ir-,* or *non-* ; or suffix, e.g. *-less.,* as is seen in following examples:

... although it's <u>impossible</u> to rule out ... (n.12)

... but the mechanism ... remains <u>unknown</u> ... (n.4)

Since the main goal of Move 3 limitation is to inform about the limitations in a previous research or an on-going research, lexical negation can be also considered as a typical feature of Move 3 limitation.

3. noun (sg./pl.) : <u>scientists</u> an its synonym and hyponyms

   synonym: as researcher

hyponyms: professor, experts

In PSRs the main function of the noun *researchers* is to refer the persons dealing with an item of a particular research and doing the main activity in a particular research.

In Move 3 limitation the noun *researchers* and its defined synonyms and hyponyms refer to the experts who are limited in doing a concrete activity or who are sceptical of obtained outcomes in a research. It can be realized by:

a) limitation: *"Paleontologists really don't know the answer to that. Why some animals survive … is one of the most difficult questions in paleontology,"* (n.7)

b)scepticism: *But researchers didn't believe that babies could make native-language-specific sounds before this age.…* (n.12)

4. lexical verb: <u>say</u> and its synonyms
   synonym: note

It was already said that the lexical verb *say* and its defined synonyms are most commonly used to express reported speech.

Reported speech in Move 3 limitation usually contains the negative comment of an expert. This comment illustrates existing obstacles and difficulties in a research or scientist's sceptical view of obtained research results.

Move 3 limitation may inform about: possible problems and failures in a research; inabilities to overcome any difficulty associated with the study; absence of elements that are important in research progress; unclear aspects in the research; scepticism of the experts in the field. This implies that the main purpose of Move 3 limitation is to introduce any kinds of limitations associated with research progress

6.4 The lexical signals of Move 3 previous research

The occurrence of lexical signals of Move 3 previous research identified in the study are provided in the Table 4. The comments on each lexical signal follow.

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb + synonyms: find	8	the adjective + synonym: previous	6
noun (sg./pl) + synonyms: study	6	noun (sg./pl.) +synonyms, hyponyms: scientist	4

table 4: the lexical signals in Move 3 previous research

6.4.1 Comments on defined lexical signals

1. lexical verb: find and its synonyms
   synonyms: uncover, unearth, identify
   hyponym: show, explain

The main purpose of Move 3 previous research is to provide information about the previous studies related to a research being popularized, therefore in this move the lexical verb *find* and the words with similar meaning are mainly used to indicate an achievement in previous studies related to a research being reported. It is realized by:

Gick's work builds on past studies showing, for instance, that … Scientists had explained such sensing prowess as the result of… (n.18)

2. noun (sg./pl): study and its synonyms
   synonym: experiment

The noun *study* and the words with similar meaning refer to the activity of gaining new knowledge through the use of examining procedures.

As Move 3 previous research can deal with the outcomes of the past works or introduce the purposes of the earlier studies related to the research being reported, the noun *study* and its defined synonyms very often occur in plural, as it is determined by the following example:

Previous studies have taken small samples of cigarette … (n.22)

This is in contrast to Move 2. Move 2 usually introduces the results of a study being reported, therefore the noun *study* and the words with similar meaning occur only in singular in Move 2.

3. the adjective: previous and its synonym
   synonym : past

The adjective *previous* and its synonym express that a particular event happened before the on-going event or that a particular object already existed before the actual one.

In Move 3 previous research the adjective *previous* indicates that a concrete research was carried out before a research being popularized. The example follows:

Previous experiments have found that we use what we already know … (n.20)

4. noun (sg./pl.): researcher and its synonym and hyponyms
   synonym: scientist
   hyponyms: student, paleontologist

In Move 3 previous research the noun *scientist* and the words with similar meaning refer to the experts who were investigating a particular fact in earlier studies. That is realized by:

Researchers led by … first explored the concept 2 years ago. … (n.17)

Move 3 previous research can contain details about earlier outcomes related to a research being reported. It can also announce the first idea of scientists, or it can also describe procedures used in previous studies. Therefore, the main purpose of Move 3 previous research is to provide information about the related previous studies.

6.5 The lexical signals of Move 4

Based on the analysis the table 5 provides the occurrences of lexical words defined as the lexical signals of Move 5. The comments on each lexical signal follow.

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb + synonyms: publish	23	noun: journal	14
noun (sg./pl) + synonyms: researcher	20	noun: issue	13
noun (sg./pl.)+synonyms, hyponyms: study	18	noun (sg./pl.)+ synonyms, hyponyms : findings	11
lexical verb+ synonyms, hyponyms: find	14		

table 5: the lexical signals in Move 4

6.5.1 Comments on defined lexical signals

1. lexical verb: publish and its synonyms
   synonyms: report, detail, appear

The lexical verb *publish* indicates that the further details of research findings are available to the public, i.e. are not secret. In addition, the verb *publish* is usually in the form of past participle to form the passive voice. That is:

The results will be published in … (n.1)

2. noun (sg./pl.): researcher and its hyponyms, synonyms
   synonym: scientist
   hyponyms: paleontologist, professor, team, colleagues

The main function of Move 4 is to present new research and to explain the purpose of the research. Therefore the noun *researcher* and the words with similar meaning occurring in Move 4 refer to the persons, doing the main activity of a research and also introducing the outcomes of a study to the public. It is realized by:

Clearing old memories … makes ways for new learning, researchers from Japan suggest in the Nov. 13 Cell.… (n.19)

Furthermore, in Move 4 the noun *researcher* and its defined synonyms and hyponyms can also report "by whom" a particular study is conducted, that is realized by:

The study, conducted by a University of … researcher and microbial … (n.22)

3. lexical verb: find and its hyponyms, synonyms
   synonyms: discovery, show
   hyponyms: see, conclude, explain, make

The lexical verb *find* and its synonyms and hyponyms indicate any kind of achievement during the examining procedures.

As the purpose of Move 4 is to present new research and to explain the purpose of the research, the lexical verb *find* and its defined synonyms and hyponyms indicate a particular goal which should be achieved during a research. That is realized by:

The two independent studies, published in … , and are the largest studies to date to try to uncover genetic association … (n.5)

4. noun (sg./pl.) : study and its synonyms
   synonyms: work, research

The noun *study* and its synonyms refer to the activities of gaining knowledge through the use of examining procedures.

In Move 4 the noun *study* and the words with similar meaning are used to refer a kind of activity whose aim is to gain new knowledge about a particular item. That activity is introduced by Move 4, since the main function of it is to introduce new research, it is determined by the following example:

The cloning of the mice forms part of a research which scientists at UAB are carrying out… (n.3)

5. noun: journal

The noun *journal* refers to a newspaper or magazine that is concerned with the particular subject or particular profession.

In Move 4 the noun *journal* marks a magazine or newspaper that deals with the item of a research being reported and where the findings of a particular study are published. That is realized by:

The findings, reported in this week's issue of the journal Nature, … (n.4)

6. noun: issue

The noun *issue* refers to a set of newspapers or magazines published for a particular day, week or month. It can also refer a single copy of a newspaper or magazine printed for the special time or give a number to a periodical, which is realized by:

The research, … , is detailed in the Nov. 26 issue of the journal Nature … (n.18)

7. the noun (sg./pl.): findings and its defined synonyms
   synonyms such as results, discovery

In PSRs the noun *findings* and the words with similar meaning refer to the fact which was not known about before. This fact is new for the experts in the concrete field and interesting for the general public.

Since the most frequent information provided by Move 4 is about the publication of obtained findings, the frequent occurrence of the noun *findings* and the words with similar meaning in Move 4 is expected, it is demonstrated by the following example:

Full findings of the study are published in the November issue of… (n.11)

Move 4 may provide several pieces of information about a research being reported: it can introduce a new research and its goal, present researchers who conducted a concrete study, introduce implications of the discovered fact, provide small

description of the methods used in a research and inform about the publication of research findings.

To sum up all these facts, the main purpose of Move 4 is defined as follows: to present a new research and to explain the purpose of the research.

6.6 The lexical signals of Move 5

Based on the analysis the table 6 shows the occurrences of lexical words defined as the lexical signals of Move 5. The comments on each lexical signal follow.

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb + synonyms, hyponyms: find	36	lexical verb: say	16
noun (sg./pl) + synonyms, hyponyms: researcher	27	contrastive conjunction: but, although	13
noun(sg./pl.) + hyponyms: participant	18		

table 6: the lexical signals in Move 5

6.6.1 Comments on defined lexical signals of Move 5

1. lexical verb: find and its defined synonyms and hyponyms
   synonyms: discover, identify, notice, observe, detect
   hyponyms: suggest, imply, appear, provide, promote, show

In PSRs the words with similar meaning to the lexical verb *find* indicate a kind of achievement in a research.

Since the main purpose of Move 5 is to indicate research results in detail, in Move 5 the lexical verb *find* and its defined hyponyms and synonyms indicate an achievement in a research being popularized or express that an examined element showed important results. Both situations are introduced by the following examples:

…*They found that those with the disease had variants of genes…* (n.5)

…*Dutch students showed improvements in their ability to recognize…* (n.8)

2. noun (sg./pl.): researcher and its synonyms, hyponyms
   synonyms: scientist
   hyponyms: paleontologist, surgeon, neuroscientist, expert, professor, student

The noun *researcher* and the words with similar meaning are used to indicate the persons dealing with the item of a research and doing the main activity of a research being popularized, to report "by whom."

In Move 5 the noun *researcher* and its defined synonyms and hyponyms indicate the persons who achieved an advance in a particular research, since the main purpose of Move 5 is to introduce research outcomes in detail.

3. noun (sg./pl.): participant and its defined hyponyms
   hyponyms: mice, listeners, students, adults, babies, infants, children, people, adolescents, women

Generally, the noun *participant* and its defined hyponyms refer to a person who is taking part in a particular activity.

Move 5 uses the noun *participants* and its defined hyponyms to refer to the objects which undergo the examining procedures. Because the main purpose of Move 5 is to indicate research results in detail, the noun *participants* and the words with similar meaning occur very often in the statements presenting concrete outcomes, it is determined by the following example:

… young adults were successful about three-quarters of the time … (n.9)

4. lexical verb: say and its synonyms
   synonyms: add, announce

In PSRs the main function of the lexical verb *say* and its defined synonyms is related to reported speech.

In Move 5 the statements identified as reported speech usually provide information about the specific outcomes of the research being reported, that is:

She says when the children listened to story that included real scary creature, they suggested the character avoid the creatures… (n.21)

This fact is in contrast with Move 3 limitation because reported speech involved in Move 3 limitation usually introduces negative or sceptical opinions of a scientist.

5. contrastive conjunction: but, although

The main function of contrastive conjunction is to connect two contrastive statements or to introduce a statement that shows surprise, annoyance or disagreement in relation to another statement.

Contrastive conjunctions *but, although* occurring in Move 5 are very often used to connect two statements that contrast, which may be realized by:

… the risk was lower, but the chance … was still 30 percent higher… (n.31)

In contrast, Move 3 limitation very often states a negative reaction to the preceded idea introduced by a different type of move usually by Move 7.

Based on the analysis, Move 5 can provide the following types of information: information about the specific observations done by the experts in the field, applications of a discovered fact or an unique idea or opinion of scientists. To take into account all these facts the main purpose of Move 5 is to indicate the main research results in detail.

6.7 The lexical signals of Move 6

Based on the analysis the table 7 shows the occurrences of lexical words defined as the lexical signals of Move 6. The comments on each lexical signal follow.

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
noun(sg./pl.) + hyponyms: participant	42	lexical verb + synonyms, hyponyms: make	18
noun (sg./pl) + synonyms, hyponyms: researcher	37	lexical verb + synonyms, hyponyms: analyze	15
noun (sg./pl) + synonyms: study	19		

table 7: the lexical signals in Move 5

6.7.1 Comments on defined lexical signals of Move 6

1. noun (sg./pl.): participants and its hyponyms

   hyponyms: volunteer, mice, rat, people, patients, children

In Move 6 the noun *participant* can refer to a person who is under medical care, generally called "patient." It can also refer to a person who chooses freely to undergo the procedures for experimentation, called a "volunteer" or it can be a special group of people characterized by a concrete feature. Experiments taking place in a laboratory

usually use experimental animals such as mice or rats, as is demonstrated by the following example:

… *The three mice in this case were cloned using….* (n.3)

2. noun (sg./pl.): researcher and it hyponym

   hyponyms such as: doctor, paleontologists, colleagues, surgeons

In the PSRs the main function of the noun *researcher* and the words with similar meaning is to indicate the persons doing the main activity in a research.

Because the main purpose of Move 6 is to describe data collection procedures, the noun *researcher* and its defined synonyms and hyponyms fulfil the function of

indicating the persons doing the main activity of the research being popularized, as is realized by the following example:

... researchers led by... analysed the genes of more than 5,000 patients … (n.5)

3. noun: study (sg./pl.) and its synonyms
   synonyms: experiment, research

In the popular scientific articles the noun *study* and its defined synonyms and hyponyms refer to the activities of gaining new knowledge through the use of examining procedures.

Since the main purpose of Move 6 is to describe data collection, the noun *study* and its defined synonyms and hyponyms refer to an activity which is described in this move. For better understanding the example follows:

In this new study, the RUPP group tested the benefits of medication ... (n.24)

4. lexical verb: make and its synonyms and hyponyms
   synonyms: create, construct, develop
   hyponyms: clone, reflect

The verb *make* and its hyponyms and synonyms identify procedures of shaping or putting parts, ingredients together.

In Move 6 the lexical verb *make* and its hyponyms and synonyms are related to the examining procedures. The scientists have to very often make, create, reconstruct, etc. some kind of component needed for the progress of a study. That is realized by:

Once the oocytes had been reconstructed, they were activated by ... (n.3)

5. lexical verb: analyze and its synonyms and hyponyms
   synonyms such as: test, explore, observe, scan

The lexical verb *analyze* and its hyponyms and synonyms refer to the action of searching an entity by separating it into its constituent parts in order to discover further details.

In Move 6 the lexical verb *analyze* or its defined hyponyms, synonyms refer to a type of investigative procedure. During this procedure the researchers try to identify causes, key factors, possible results, etc., as it is determined by the following example:

…each subject was observed running barefoot and with shoes.… (n.32)

Based on the analysis, Move 6 provides information about the technology, tools and techniques used in the study. It can also provide information about the analyzed subjects and the exact number of the participants involved in a study. Therefore, the main purpose of Move 6 is defined as follows: to describe data collection procedures.

6.8 The lexical signals of Move 7

Based on the analysis the table 8 shows the occurrences of lexical words defined as the lexical signals of Move 7. The comments on each lexical signal follow.

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb + synonyms, hyponyms: find	74	noun (sg./pl) + synonyms: study	26
lexical verb + synonyms, hyponyms: say	57	noun (sg./pl.) + synonyms: findings	26
noun (sg./pl) + synonyms, hyponyms: researcher	41	contrastive conjunctions: but, however, although	25

table 8: the lexical signals in Move 7

6.8.1 Comments on defined lexical signals of Move 7

1. lexical verb: <u>find</u> and its synonyms and hyponyms
   synonyms: uncover, release, identify, observe, indicate, point out
   hyponyms: explain, suggest, propose, express, show, appear, provide

The main function of Move 7 is to indicate the main research outcomes and provide their description and explanation. Therefore, the lexical verb *find* and its defined synonyms and hyponyms in Move 7 indicate an achievement obtained in a research. That is illustrated in the following example:

"*We <u>found</u> that four different brain areas <u>show</u> correlation …* (n.26)

2. lexical verb: <u>say</u> and its synonyms and hyponyms
   synonyms: tell, report, add, state, note
   hyponyms: warn, write, stress

The main function of the lexical verb *say* and the words with similar meaning is related to the reported speech. Reported speech involved in Move 7 primarily contains descriptions of research outcomes or their significances, which is realized by:

"The results show that the parent training intervention can be delivered in a reliable manner… ," said Scahill. "This is important because it shows that… " (n.24)

3. noun (sg./pl.): researcher and its synonyms, hyponyms
   synonyms: scientist
   hyponyms: team, group, paleontologist, linguist, experts, professor

The purpose of the noun *researcher* and its defined synonyms and hyponyms is to indicate the person(s) doing the main activity in a research being popularized, to report "by whom."

In Move 7 the noun *researcher* and its synonyms and hyponyms indicate "by whom" the new facts in a concrete area have been discovered. That is realized by:

The researcher found that English subtitles were associated with… (n.8)

4. noun (sg./pl.): study and its synonyms and hyponyms
   synonyms: research, analysis, testing, experiment
   hyponyms: project, operation, surgery

In Move 7 the noun *study* and the words with similar meaning refer to the activity of gaining knowledge through examining procedures that have already been accomplished. For better understanding example follows.

According to the study, those who smoked the most … had highest likelihood for developing diabetes … (n.31)

Move 7 informs about the main significances of a research being popularized or it can compare the results of the study being reported with the results of related studies. Therefore, the noun *study* and the words with similar meaning can occur either in singular or in plural, in contrast to Move 2. In Move 2 the noun *study* and its defined hyponyms, synonyms always occur in singular, since Move 2 introduces overall outcomes of a particular study.

5. contrastive conjunctions: but, however, although

In Move 7 contrastive conjunction connects two contrastive statements involved in one particular Move 7, as is determined by the following example:

The pigments have proven safe and durable, Dr. Subramanian said, although not cheap because of the cost of the indium. (n.28)

This fact is in contrast to Move 3 limitation, since Move 3 limitation often states a negative reaction on the preceded idea introduced in different type of move.

6. noun(sg./pl.): finding and its synonyms
   synonyms: result, discovery, fact, demonstration

The main purpose of the noun *findings* and its defined synonyms inform about the found element usually discovered for the first time in a particular research.

Since the primary purpose of Move 7 is to introduce the main results of a study, the occurrence of the noun *findings* is mainly in statements discussing the results of the research, as illustrated in the following example:

The findings indicate that newborn infants are already making … (n.12)

According to the analysis Move 7 contains important information dealing with the main outcomes of the particular research. It introduces the significant outcomes of a research in a several possible ways, such as indicating significances, interpreting particular results, justifying particular results or comparing observations with similar observations made in related studies. Therefore, the main purpose of Move 7 is defined as follows: to provide description and explanation of the main research outcomes.

6.9 Lexical signals of Move 8

Based on the analysis the table 9 shows the occurrences of lexical words defined as the lexical signals of Move 8. The comments on each lexical signal follow.

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb +synonyms, hyponyms : show	19	noun (sg./pl.) + synonyms, hyponyms : treatment	12
lexical verb +synonyms: say	17	lexical verb +synonyms, hyponyms : help	9
noun + synonyms : study	16	noun (sg./pl.)+ synonyms, hyponyms : findings	9
noun(sg./pl.) + its synonyms, hyponyms : researcher	13	adjective: new	9

table 9: the lexical signals in Move 8

6.9.1 Comments on defined lexical signals of Move 8

1. lexical verb: show and its synonyms and hyponym
   synonyms: provide, figure out, uncover,
   hyponym: assess, offer, identify, answer, explain, suggest

In Move 8 the lexical verb *show* and its defined synonyms and hyponyms may indicate an achievement in a particular study. They can also indicate a planned aim of a future study, as demonstrates following example:

"…we will conduct follow-up research to determine the possible roles of these organisms in tabacoo-related disease…" … (n.22)

2. lexical verb: say and its synonyms
   synonyms: add, conclude, recommend

In Move 8 the main function of the noun *say* and its defined synonyms is related to reported speech that contains three types of information: about the future studies dealing with the examined entity in greater detail, about concrete implications of the obtained results or contains conclusions made by a particular expert.

3. noun (sg./pl.): study and its synonyms
   synonyms: research, trial, work

The noun *study* and its defined synonyms refer to the activities of gaining knowledge through examining a subject or a puzzling question in detail.

Based on the analysis, in Move 8 the noun *study* and the nouns with similar meaning mainly occur in the two different kinds of statement. One type of statement discusses the possible implications of the research results, which is realized by:

… Our work has identified a treatment in mice that can reverse the cognitive impact of sleep deprivation.… (n.4)

The other type introduces further studies build on the results of the research being reported, as is illustrated by the following example:

… Sayfan plans to conduct further studies in the area … (n.21)

4. noun (sg./pl): researcher and its synonyms, hyponyms
   synonyms: scientist

hyponyms: group, colleague, palaeontologist, psycholinguistic, team, archaeologist, professor

In Move 8 the main purpose of the words with similar meaning to the noun *researcher* is to indicate the person(s) doing the main activity of the research being popularized, to report "by whom." Moreover, Move 8 contains reported speech; therefore, the noun *researcher* and its defined synonyms and hyponyms may also refer to the particular expert who is being reported, which is realized by:

"...rethinking of not only our evolutionary past, but also that of our living relatives: the great apes," said Alan Walker, professor of ... (n.1)

5. noun (sg./pl.): treatment and its synonyms, hyponyms
   synonyms: therapy, approach
   hyponyms: strategy, method, way

In Move 8 the noun *treatment* and the words with similar meaning indicate the procedure of a particular research. This type of procedure focuses on obtaining a specific goal or result which should bring a benefit for a target subject of a study.

During the analysis it was observed that in Move 8 the noun *treatment* and the words with similar meaning mainly occur in the statements dealing with the need for future studies or discussing implications of the research findings. That is realized by:

a) future studies …*Future studies may also look for ways in which the parent training …* (n.24)

b) implications… *better understanding … may lead to better treatment …* (n.26)

6. lexical verb: help and its synonyms, hyponyms
   synonyms: protect, aid, promote, boost, treat

In Move 8 the lexical verb *help* and its defined synonyms indicate that a discovered fact is able to improve a puzzling situation or make it easier for future exploration, that is:

The discovery of Mahakala … dinosaurs is helping paleontologists paint new details on the mosaic … (n.7)

7. noun (sg./pl.): findings and its synonyms
   synonyms: discovery, result, detection
   hyponym: understanding

Based on the analysis, in Move 8 the noun *findings* and its defined synonyms refer to a discovered fact in a research being reported. Moreover, these words can occur in the statements describing possible implications, as is determined by the following example:

... *These findings also have educational implications* ... (n.8)

Furthermore, the noun *finding* and its defined synonyms can also occur in the statements discussing a need for further study, as illustrates following example:

... *"Our observations emphasize a need to further evaluate ..."* ... (n.11)

8. adjective: new and its synonym
   synonym: novel

In Move 8 the adjective *new* and the words with the similar meaning characterised a recently discovered fact. It also indicates a change in the concrete field of science thought to be beneficial and positive for the future progress of a concrete study, which is realized by:

...*We hope this new understanding will one day provide*... (n.5)

Move 8 can provide information about the possible implications of the study as well as need for the future studies. It can also inform about the contributions that the study has made to the field or may state the main conclusion of the research being popularized. Therefore, the main purpose of Move 8 is defined as follows: to provide research conclusions and relevant implications of the research results.

7 Results based on the analysis

The results obtained in the study indicate that the structure of popular scientific reports can be made up by eight possible moves each fulfilling its particular purpose. During the analysis it was observed that not every article contained all eight moves. Especially Move 1 and also Move 3 previous research does not occur very often in popular scientific articles. In 35 analyzed articles only eight occurrences of Move 1 and nine occurrences of Move 3 previous research were identified. On the other hand, Move 5 and Move 7 almost always occur in popular scientific articles. It can be influenced by the fact, that Move 5 is the first move that introduces specific outcomes of a particular study in detail and Move 7 indicates main outcomes of a particular research.

The results also indicate that the organisation of moves in popular scientific articles is not fixed. This is in contrast to Nwogu's structure of Medical popularized texts. According to him "there exists hierarchical order for the organization of moves in the texts." (Nwogu, 1991:119). Based on my analysis, only two moves have fixed locations in popular scientific reports, namely Move 2 and Move 5. Since the main purpose of Move 2 in PSRs was defined as follows: to announce the main outcomes of the research, Move 2 in popular scientific reports is very often located at the beginning. Move 5 is determined to be the first move presenting specific outcomes of a research to a non-specialist reader in detail, therefore it commonly precedes Move 7, which primarily fulfils the purpose of indicating main results and significances of a particular research.

The schematic structure of popular scientific reports may be divided into the three basic steps that are in conformity with "DEE system", i.e. Description, Explanation, Evaluation. Journalists usually follow this 'DEE System' in the process of presenting news items (Nwogu, 1991:120). As was already said, each move in the structure of popular scientific articles fulfils its particular purpose. Therefore, on the basis of these purposes it is possible to classify moves according to "DEE System."

The first step referring to Description can include the following moves: Move 1 which describes background of a particular research, Move 2, which introduces the main topic of a research being reported; Move 3 previous research, which describes previous researches related to a research being popularized; Move 3 limitation, which describes limitations in a particular study; Move 5, which describes results in detail and; Move 6 which describes the methods used in a particular research. The second step referring to Explanation may include moves such as: Move 3 larger context, which provides an explanation of general knowledge about a studied issue; Move 4, which explains the purpose of a research being reported; and Move 7, which explains the main research outcomes. The third step referring to Evaluation can include the following moves: Move 7, which indicates the significances of main research outcomes; and Move 8, which provides the research conclusions and possible implications of the research results.

Each move involved in the PSRs fulfils its particular purpose in the PSRs. Each move, except Move 1, also contains "Constituent Elements" that are used to present specific information in a concrete move. Since my work is focused on lexical signals, these constituent elements refer to the lexical signals - the most frequent occurrence of a specific lexical word in one particular move.

During the analysis it was also observed that several lexical words were defined as the lexical signals in five moves at least. Since the purposes of moves are not similar, the role of one concrete lexical word and its defined synonyms and hyponyms in different types of moves is not usually similar as well. The role of a concrete lexical word is based on the particular purpose of a particular move. These lexical words defined as the lexical signals in five moves at least are presented by:

1. the noun researcher and its defined synonyms and hyponyms
   the occurrence in - Move 2, Move 3 previous research, Move 3 limitation, Move 4, Move 5, Move 6, Move 7, Move 8
2. the lexical verb say
   the occurrence in - Move 3 previous research, Move 3 limitation, Move 3 larger context, Move 5, Move 7, Move 8
3. the lexical verb find and its defined synonyms and hyponyms
   the occurrence in - Move 2, Move 3 previous research, Move 5, Move 7, Move 8

4. the noun study and its defined synonyms, hyponyms
   the occurrence in - Move 2, Move 3 previous research, Move 6, Move 7, Move 8

In terms of lexical signal this fact supports the idea, that the genre of Science Popularization may be characterised by these four lexical signals.

8 Conclusion

In my work, devoted to the topic of the Lexical Signals in the Generic Structure of Popular Scientific Reports (PSRs), I intended to introduce the genre of Science Popularization, to identify generic structure of the popular scientific reports and to identify the lexical signals of each move organizing the information in the PSRs.

In theoretical part, specifically in the part 2 was introduced a genre and also three different views of the genre according to three different genre studies: rhetoric genre studies, systemic functional linguistics (SFL) and English for Specific Purposes (ESP). In this section the most essential characteristics of the genre were also discussed: purpose and structure. The purpose of genre is realized by the way how people use language to achieve culturally appropriate goals. The structure is considered as the major representative of the purpose of genre, since it is created by the series of moves each fulfilling its concrete purpose.

The following section was devoted to the Science Popularization and to the definition of popular scientific reports. This definition underlines the fact that popular scientific reports are not identified as a social interaction, but as a transactional genre with the main purpose of transmitting information. In the PSRs the transmitted information is determined as the information concerned with the recent scientific finding.

Since this study was based on the Nwogu's structure of Science Popularization - his work is the only one dealing with the generic structure of popularized scientific texts - the next section in the theoretical part described Nwogus' study which was focused only on Medical Popularization. According to Nwogu, there exists the schema for popularized scientific texts, but this schema is not fixed and its variations are possible.

The last section of the theoretical part was devoted to a description of the modified structure used during this study. This part described all eight moves in detail and also introduced the main purpose of each move.

Under this work the recognition of the generic structure in popular scientific reports and relevant understanding of the purposes of all moves - smaller parts of a text organizing the information in PSRs - were identified as the two essential steps to a possible identification of lexical signals in the generic structure of the PSRs.

In the practical part were discussed the functions of each identified lexical signals obtained from the analyses. The functions of the lexical signals are always subordinated to the purpose of a concrete move.

The last section of the practical part introduced the main study outcomes. It was found that the structure of popular scientific reports can be made up by eight possible moves each fulfilling its particular purpose. It was also observed that all eight moves are not always used to organize the information in the popular scientific articles. Concretely, Move 1 and Move 3 previous research occur occasionally in the PSRs occasionally. In this section was also mentioned a possible division of moves according the to "DEE system" i.e. Description, Explanation, Evaluation.

The last important observation introduced in this part was related to the identification of the lexical signals in the genre of Science Popularization. The results obtained in the study showed that several words identified as the lexical signals occurred in more than four moves. This fact supports the idea that in terms of the lexical signals, the genre of Science Popularization may be characterised by the four lexical signals:

1. the noun researcher and its synonyms and hyponyms,
2. the lexical verb say
3. the lexical verb find and its synonyms and hyponyms
4. the noun study and its synonyms, hyponyms

Since to the genre of Science Popularization has been paid a little attention, I hope that this work will make a kind of contribution to this puzzling area.

9 Resumé

Rapidní vzestup populárně vědeckých zpráv má spojitost s nárůstem populárních magazínů a novin. Dalším faktorem, který ovlivnil tento rapidní vzestup populárně vědeckých zpráv, je zájem o vědu v dnešní moderní společnosti. Mezi vědeckým světem a světem medií existuje určitý druh vzájemné součinnosti. Je však nutné si uvědomit, že tyto dva světy se značně odlišují ve způsobu, jakým odkrývají veřejnosti fakta.

Hlavním cílem této práce je určit Lexikální signály v žánrové struktuře populárně vědeckých zpráv.

V teoretické části se na základě dostupné literatury snažím vysvětlit podstatu žánru a uvádím zde tři různé pohledy tří různých studií, jež se zabývají problematikou žánru. Jedná se o studie žánru z hlediska rétoriky, funkčnosti žánru, a z hlediska použití anglického jazyka s určitým cílem. Jako definici žánru jsem převzala definici Swalese, jež je v této části také uvedena.

Následující kapitola je zaměřena na žánr populárně vědeckých zpráv. Zde je uvedena definice, která se snaží podtrhnout tu skutečnost, že populárně vědecké zprávy nejsou brány jako žánr sociální interakce, ale jako žánr, jehož hlavním cílem je předání informace. V populárně vědeckých zprávách jde především o informace týkající se nedávného vědeckého objevu.

Tato studie vychází ze studie Nwogy, jehož práce, pokud vím, je jediná, která se zabývá problematikou populárně vědeckých zpráv. Z tohoto důvodu následující kapitola popisuje tuto studii a výsledky z ní získaných. Nwogu ve své práci tvrdí, že populárně vědecké zprávy mají určitou strukturu. Tato struktura, dle jeho názoru, není pevná a její obměny jsou možné.

Struktura, použitá v této práci, je představena v kapitole č. 4. Každá "move" je zde podrobně popsaná a u každé "move" je také definována její hlavní funkce v textu

populárně vědeckých zpráv. "Moves" je Swalesovo označení menších částí textu, které organizují informace v textu.

Praktická část této bakalářské práce je zaměřena na analýzu textů populárně vědeckých zpráv s cílem identifikovat lexikální signály v každé menší části textu, odborně nazvané "move". Lexikální signál označuje lexikální slovo, které se v dané "move" vyskytuje často a vzhledem k ní plní určitý účel. Z tohoto důvodu je samotná analýza podřízena dvěma nezbytným krokům. Prvním krokem je určení všeobecné struktury - organizace informací v textu - populárně vědeckých zpráv. Druhý a velice podstatný krok k možné analýze lexikálních signálů souvisí s pochopením účelů všech menších částí textu, které organizují informace v textu populárně vědeckých zpráv. Po těchto dvou krocích je možné začít s analýzou všeobecné struktury populárně vědeckých prací v rámci identifikace lexikálních signálů v každé "move".

Analýza lexikálních signálů, jež je vytyčená jako hlavní úkol této práce, zahrnuje zkoumání 35 populárně vědeckých článků, náhodně nalezených na internetu. Pro každou "move" byla vytvořena tabulka se třemi základními údaji: číslo článku, konkrétní lexikální slovo a pořadové číslo jeho výskytu. Pokud se slovo vyskytovalo téměř v jedné třetině nalezených "moves", je v tabulce označeno zelenou barvou a považováno za lexikální signál. V opačném případě je slovo označeno barvou žlutou.

Poslední kapitola praktické části informuje o výsledcích, získaných z analýzy. Během analyzování 35 populárně vědeckých článků bylo zjištěno, že struktura tohoto typu zpráv je tvořena osmi "moves", při čemž každá "move" plní v textu populárně vědeckých zpráv určitý účel. Dále bylo zjištěno, že ne vždy je text populárně vědeckého článku organizován všemi osmi "moves". Konkrétně Move 1 a Move 3 previous research se v populárně vědeckých článcích objevují jen občas. Analýza také ukázala, že některé lexikální signály se vyskytují ve více jak pěti "moves". Jedná se především o následující slova: podstatné jméno *researcher* a slova jemu významem podobná, sloveso *say*, sloveso *find* a slova jemu významově podobná a podstatné jméno *study* a slova jemu významově podobná.

Na základě tohoto zjištění může být řečeno, že žánr populárně vědeckých prací může být v rámci lexikálních signálů charakterizován výše uvedenými čtyřmi signály.

Jelikož žánru populárně vědeckých zpráv nebyla dosud věnována dostatečná pozornost, doufám, že tato bakalářská práce bude v této oblasti určitým přínosem.

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11 Appendices

Appendix number 1: Tables of Analyses of Moves

Appendix number 2: Data Sources

Appendix n.1: Tables of the Analyses of Moves

table 1.1 Analysis of Move 2

art.	lexeme	ord. numb.	art.	lexeme	ord. numb.	art.	lexeme	ord. numb.
1	offer - v. new - adj. clue - n. how - adv. scientists - n. say - v.	1 1 1 1 1 1	2	astronomers-n. find - v. new - adj. evidence - n. theory -n.	2 2 2 2 2	3	researchers - n. university - n. first - adj. clone - v.	3 1 1 1
4	research - n. biologist - n. university - n. find - v. pathway - n.	2 4 2 3 3	5	people - n. teams - n. researchers - n. find - v.	1 5 6 4	6	but - conj. evidence - n. mount - v. first - adj.	1 3 5 2
7	uncover - v. key - adj. piece - n. how - adv. paleontolog -n. say - v.	6 1 1 2 7 2	8	no move 2		9	No move 2	
10	researchers - n. trace - v. first-adj.	8 3 3	11	researchers - n. university - n. determine - v. improve - v.	9 3 7 2	12	new - adj. study - n. find - v. babies - n. first-adj. produce - v.	3 3 8 2 4
13	paleontolog.- n unearth - v. new - adj. prompt - v.	10 9 4 10	14	prevent-v. enable-v. scientists - n. say - v.	 11 3	15	but - conj. finding - n. hint - v. possible-adj. treatment - n.	2 4 11 4
16	now - adv. team - n. believe - v. know - v. why - adv.	 12 1	17	researchers - n. report - v. make - v.	13 4 12	18	but - conj. new - adj. study - n.	3 5 5
19	new - adj. study - n. show - v. part - n.	6 6 13	20	new - adj. study - n. offer - v. tip - n. evidence	7 7 14 5	21	new - adj. study - n. suggest - v. way - n. research - n. offer - n. how - adv.	8 8 15 6 9 16 3
22	claim - v. new - adj. study - n.	17 9 10	23	researchers - n. university - n. discover - v. teens - n.	14 4 18 3	24	reduce treatment - n. include - v. parents - n. university - n. researchers - n. colleagues - n.	1 7 4 5 15 16
25	colleagues - n. university - n. discover - v. factor - n.	17 6 19 2	26	new - adj. study - n. investigate - v children - n. support - v. importance	10 11 19 4 20	27	team - n. researchers - n. university - n. develop - v. way - n. stimulate-v.	18 19 7 21 8

28	chemists - n. university - n. create - v. new - adj.	20 8 22 10	29	new - adj. evidence - n. reduce - v.	11 4 2	30	scientists - n. find - v. link - n.	21 23 19
31	researchers - n. find - v. people - n. increase first	22 24 5 3 5	32	although - conj. prove - v. benefits - n. increase - v.	4 4	33	researchers - n. decide - v. find out - v	23 7 25
34	women - n. new - adj. study - n. find - v.	6 12 13 26	35	university - n. team - n. women researchers - n. say - v. therapy -n. increase - n.	9 24 7 25 4 9 5			

the overall number: **33 moves 1/3 = 11**

table 1.2: Defined lexical signals in Move 2

Lexeme/group of lexemes	**Number of occurrences**	**Lexeme/group of lexemes**	**Number of occurrences**
lexical verb +synonyms, hyponyms : find	26	noun + synonyms : study	13
noun + its synonyms, hyponyms : researcher	25	adjective: new	12

table 1.3: Synonyms and Hyponyms of lexemes

lexeme	**synonyms**	**hyponyms**	**lexeme**	**synonyms**
find	discover, unearth, investigate	offer, show, suggest, hint, claim, create, make, develop	study	research, experiment, work
researchers	scientists	astronaut, paleontolog, biologist, chemist, neuroscientist, team, colleague		

table 2: Analysis of Move 3 larger context

art.	lexeme	ord. numb.	art.	lexeme	ord. numb	art.	lexeme	ord. numb.
1 2x	1.move researchers still - adv. when - adv. common - adj. 2.move nickname scientist believe	 1 1 1 1 1 2 2	2	no M3		3	located - adj. where - adv. find - v.	 2 1
4	no M3 larger c.		5	disease affect characterise -v.	1 1	6	find - v. sit - v. location - n. also - adv.	2 1
7 4 x	1. move find - v. part - n. name - v. 2.move co-author - n. 3.move group - n. know - v. include - v. say - v. 4.move make - v. note - v. say - v.	 3 1 2 3 1 1 1 1 1 2 3	8	no M3 larger c.		9	no M3	
10	region - n. colleague-n. look at - v. call - v. locate - v.	2 4 1 3 1	11	result in - v. disabilities - n. reduced - v. adults - n. common - adj. cause - v.	1 2 1 2 2	12	baby - n. bear - v. long - adj. time - n. develop -v. include - v.	2 2 2
13	have - v. classic - adj. group - n. say - v. call - v.	1 2 4 4	14 2x	1. move call - v. belong - v. group - n. know - v. role - n. cause - v. 2. move occur region - n. result in	 5 3 2 3 2 3 4	15	people have - v. also - adv. call - v. help - v. focus - v.	3 2 2 6 2
16	still - adv. oldest - adj. known - adj. have - v.	2 1 3	17	no M3 larger c.		18	no M3 larger c.	
19	scientists - n. know - v. transfer - v.	5 3 3	20	when - adv. couple - n. students-n.	5 4 4	21	no M3	

	storage - n. reside - v.	4 4		have - v. say - v.	4 5			
22	no M3 larger c.		23	no M3 larger c.		24	no M3 larger c.	
25	disease - n. form - n. affect - v.	3 2	26	1. move children have - v. limitations difficulties - n. say - v. professor 2. move refer - v. clear - adj. occur - v. areas - n. say - v. rely on - v.	 5 5 4 5 6 6 7 5 5 7	27	babies have - v. disease - n. where - adv. fail - v. leave - v. turn - v. refer - v.	6 6 6 8
28	no M 3		29	no M 3		30	no M3 larger c.	
31	common - adj. disease - n. produce - v. normally - adv. lower - v.	3 7 3	32	no M3		33	how - adv. contain where - adv. grow - v. have - v.	 3 7
34	common - adj. infect - v. cause - v.	4 4	35	say know - v	8 4			

the overall number: **27 moves 1/3 = 9**

table 2.1 Defined lexical signals in Move 3 larger context

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexeme	Number of occurrences
lexical verb: say	8	lex. verb + synonyms - call	8

table 2.2: Synonyms and Hyponyms of lexemes

lexeme	synonyms	hyponyms	lexeme	synonyms	hyponyms
call	name refer nickname		say	note	

table 3: Analysis of Move 3 - limitation

article	lexical signal	ordinal numb.	article	lexical signal	ordinal numb.	article	lexical signal	ord. numb.
1	no M3 limitation		2	no M3		3 on-go.	however- conj. scientists - n. obtain - v. data - n.	1 1 1 1
4 1. on-go. 2. on-go.	<u>1. move</u> know - v. have - v. include - v. but - conj. affect - v. remain - v. unknown - adj. <u>2.move</u> include - v. but - conj. remain - verb unknown - adj.	 1 1 1 2 1 1 1 2 3 2 2	5 on-go.	although-conj. treatment improve - v. disease	4 1 1 1	6 on-go	1. move not - adv. neg. know - v.	 1 2
7 on-go.	but - conj. experts - n. disagree- v. how - adv. help - v. paleontolog.-n. not - adv. neg. know - v. answer - n. why - adv. most - adv. difficult - adj. question - n. study - n. say - v. seem - v. have - v.	5 2 1 1 3 2 3 1 1 1 1 1 2	8 on-go.	not - neg. however -conj. allow - v. participants -n. improve - v. understanding-n. new - adj.	3 6 2 1 2 1	9	no M3	
10 on-go	but - conj. know - n. important - adj. troublingly unable - adj. pin sth. down say - v. not - gram.neg. puzzling question - n.	7 4 1 1 2 4 2 2	11	no M3 limit.		12 1. past 2. on-go	<u>1. move</u> but - conj. researchers - n. not - adv. believe - v. make - v. babies - n. <u>2.move</u> although-conj. impossible -adj. show -v. results -n.	 8 4 5 2 2 9 2 2
13	no M3 limit.		14 on-go.	but - conj. note - v. strategies - n. fail - v.	10 3 1	15	no M3 limit.	

16	no M3 at all		17 past	but - conj. remain - v. scientist - n. also-adv. explore - v. not - adv. neg. wonder - v.	11 3 5 1 6	18	no M3 at all	
19 on-go.	scientists - n. know - v. not - adv. neg. how - adv. researchers - n. also-adv. debate - v. only - adv. new - adj.	6 5 7 2 7 2 1 2	20	no M3 limit.		21	no M3 at all	
22	no M3 limit.		23 past	although-conj. previous -adj. study - n. find - v. adults - n. not - adv. clear - adj. why - adv. say - v.	12 1 1 3 3 8 2 4	24 past	results - n. show - v. reduce - v. problems - n. children - n. however -conj. return - v. when - adv. discontinue -v. effective-adj. treatment-n. also-adv. adverse - adj. effects - n. lead to - v.	3 4 2 4 3 4 1 2 3 1 1
25	no M3 limit.		26	no M3 limit.		27 on-go.	still-adv. risks - n. include - v. failure - n.	 1 3 1
28	no M3 limit.		29	no M3 at all		30 1. on-go. 2. on-go.	<u>1.move</u> why - adv. question - n. astronomers-n unable - adj. answer - v. not - adv. enough - adv needed - adj. <u>2. move</u> but - conj. remain - v. sceptical say-v. researchers-n. only-adv. not - adv. also-adv. believe-v. understand-v. enough - adv. how - adv. no - adv. detect	 5 3 8 3 5 9 1 13 8 5 9 2 10 4 2 2 4 6
31 on-go.	also - adv. known - adj.	5	32	no M3 at all		33 on-go.	but - conj. not - adv..	15 12

	make - v. when - adv. but - conj. not - adv. result lead to - v. failure - n. damage - n. people - n. increased - adj. risk - n. develop - v. unclear - adj.	3 6 14 11 4 2 2 3 5 5 2 4 1					ruin - v.	2
34 1. on-go 2. on-go 3 on-go	<u>1. move</u> although-conj. treatment-n. recur-v. say-v. <u>2. move</u> fail - v. improve-v. women-n. remain - v. unclear - adj. benefit - n. say-v. <u>3.move</u> remain - verb unclear - adj. how - adv. effective - adj say-v.	 16 3 3 6 3 3 6 4 2 7 5 3 7 2 8	35 1. on-go 2. on-go	<u>1.move</u> but - conj. effects - n. <u>2.move</u> professor-n. say-v not -gram. neg. possible - adj. effectively-adv. enough - adv.	 17 4 10 9 13 3			

the overall number: 25 moves **1/3 = 8**

table 3.1: Defined lexical signals in Move 3 limitation

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
contrastive conjunctions: but, although, however	17	noun (sg./pl.) +synonyms, hyponyms: scientist	10
the adverb: not	13	lexical verb + synonyms: say	9

table 3.2: Synonyms and Hyponyms

lexeme	synonyms	hyponyms
scientist	researcher	professor expert

table 4: Analysis of Move 3 - previous study

art.	lexeme	ordinal number	art.	lexeme	ordinal numb.	art.	lexeme	ordinal numb.
1	past - noun scientists - n. when - adv student - n. find - v. take - v. years - n. recover - v. analyse - v.	1 1 2 1 1 1 2 1	2	no M3 at all		**3**	no M3 p. study	
4	no M3 p. study		5	previous - adj. studies - n.	1 1	**6**	no M3 p. study	
7	no M3 p. study		8	no M3 p. study		**9**	no M3 at all	
10	no M3 p. study		11	no M3 p. study		**12**	no M3 p. study	
13	no M3 p. study		14	no M3 p. study		**15**	no M3 p. study	
16	no M3 at all		17	not - adv. new - adj. researchers explore - v. years	 3 2 2	**18**	work - n. past - adj. studies - n. show - v. say - v. scientists - n. explain - v. result - n.	2 2 3 5 2 4 5
19	no M3 p. study		20	previous - adj. experiments - n. find - v.	3 4 6	**21**	no M3 at all	
22	previous - adj. studies - n. take - v.	4 5 2	23	no M3 p. study		**24**	no M3 p. study	
25	no M3 p. study		26	studies - n. know - v say - v.	6 4	**27**	no M3 p. study	
28	past - n.	2	29	no M3 at all		**30**	no M3 p. study	
31	no M3 pr. study		32	no M3 at all		**33**	no M3 p. study	
34	no M3 p. study		35	previously -adv. show - v.	1 7			

the overall number: 9 moves **1/3 - 3**

table 4.1: Defined lexical signals in Move 3 previous research

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb + synonyms: find	8	the adjective + synonym: previous	6
noun (sg./pl) + synonyms: study	6	noun (sg./pl.) +synonyms, hyponyms: scientist	4

table 4.2: Synonyms and hyponyms

lexeme	synonyms	hyponyms	lexeme	synonyms	lexeme	synonyms	hyponyms
scientist	researcher	student, paleontologist	study	experiment	find	uncover unearth	show

table 5: Analysis of Move 4

art.	lexeme	ordinal numb.	art.	lexeme	ordinal number	art.	lexeme	ordinal numb.
1 **2x**	1. move findings - n. work - n. paleontol. - n. results - n. publish - v. journal - n. 2. move scientists - n. credit - v.	 1 1 1 2 1 1 2	**2**	no Move 4		**3**	repetition 1.a) move research - n. carry out - v. study - n. new - adj. ways - n. improve - v. 1.b) move discover - v. use - n. contribute -v. increase - v.	 2 1 2 1 1 1 1 2 2 3
4	develop - v. findings - n. report - v. issue - n. journal - n. present - v. new - adj. approach-n. treat - v. involve - v.	1 3 2 1 2 2 3 4 1	**5** **2x**	1. move studies - n. try - v. uncover - v. 2. move studies - n. publish - v. issue - n. involve - v. try - v. uncover - v.	 4 1 2 5 3 2 2 2 3	**6**	findings - n. present - v. appear - v. issue - n. journal - n.	4 4 5 3 3
7	colleagues - n. present - v. finding - n. issue - n. journal - n.	3 5 5 4 4	**8**	new - adj. study - n. publish - v. show - v. how - adv. improve - v.	3 6 6 4 5	**9** **2x**	scientists - n. want to - v. see - v. understand - v. report - n. appear - v. issue - n.	4 1 5 1 7 5
10	new-adj. study-n. detail-v. issue - n. journal - n. scientists - n.	4 7 8 6 5 5	**11** **2x**	findings - n. study - n. publish - v. issue - n. 2.move report - n. explain - v. adults - n. develop - v.	6 8 9 7 2 6 1 2	**12**	scientist - n. study - v. say - v. new - adj. study - n. backs up - v.	6 1 1 5 9 1
13	paleontologist say - v. scientists - n. team - n.	7 2 8 9	**14** **2x**	1.move findings - n. publish - v. have - v.	 7 10	**15**	now - adv. colleagues - n. try - v. disorder - n.	 9 4

	begin - v. years - n. unearth - v.	7 7		implication-n. 2.move decide - v. try - v. find - v. effect - n. say - v. professor - n	4 3 8 3 8			
16	no Move 4		**17**	store up - v. team - n. report - v. week - n.	 10 11	**18** **2x**	1.move research- n. flip - v. how - adv. 2.move research- n. detail - v. issue-n. journal-n.	 10 11 12 8 6
19	make - v. way - n. new - adj. researchers-n. suggest - v.	3 5 6 11 9	**20**	psychol.-n. want to - v. see - v. work - v.	12 3 10 2	**21**	no move 4	
22	study - n. conduct - v. researcher-n. first - adj. show - v.	12 1 13 11	**23** **2x**	teenagers- n. study - n. publish - v. journal - n. 2. move researcher- n. launch - v. study - n	2 13 13 7 14 1 14	**24**	publish - v. issue - n. journal study - n. conduct - v. professor - n.	14 9 8 15 2 15
25	present - v. findings - n. issue - n. journal	15 8 10 9	**26**	results - n. publish - v. issue	9 16 11	**27**	researcher - n. present - v. work - n.	16 17 16
28	findings - n. appear - v. journal - n.	10 18 10	**29**	scientists - n. lead - v. detail - v. findings - n. issue - n. journal - n.	17 3 19 11 12 11	**30**	report - v. journal - n. team - n. lead - v. conclude - v.	20 12 18 4 12
31	new - adj. research - n. publish - v. issue - n. suggest - v.	7 17 21 13 13	**32**	study - n. publish - v. issue - n. journal - n. researchers- n. conclude - v.	18 22 14 13 19 14	**33**	no move 4	
34	new - adj. treat - v. researchers- n. report - v. journal - n.	8 7 20 23 14	**35**	no move 4				

the overall number: 37 moves **1/3 = 12**

table 5.1:Defined lexical signals in Move 4

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb + synonyms: publish	23	noun: journal	14
noun (sg./pl) + synonyms: researcher	20	noun: issue	13

noun (sg./pl.)+synonyms, hyponyms: study	18	noun (sg./pl.)+ synonyms, hyponyms : findings	11
lexical verb+ synonyms, hyponyms: find	14		

table 5.3: Hyponyms and synonyms

lexeme	synonyms	hyponym	lexeme	synonym	hyponyms	lexeme	synonyms
publish	report, detail, appear		find	discover	see, conclude, explain, show	findings	results, discovery
researcher	scientist	paleontolog., team, professor, colleague	study	research, work			

table 6: Analysis of Move 5

art.	lexeme	ordinal number	art.	lexeme	ordinal number	art.	lexeme	ordinal number
1	scientists - n.	1	**2**	scientists - n.	5	**3**	mice - n.	1
	believe - v.	1		find - v.	3		say - v.	2
	discover - v.	1		size - n.	1		researchers - n.	6
	study - v.	1		but - conj.	1			
	years - n.	1		announcement-n.	4			
	team - n.	2		increase - v.	1			
	researchers - n.	3		newly - adv.	2			
	support - v.	1		bigger - adj.	1			
	belief - n.	1		discover - v.	4			
	show - v.	2		larger - adj.	2			
	say - v.	1		small - adj.	1			
	paleontologist-n	4						
	make - v.	1						
	include - v.	1						
4	just - adv.		**5**	1. move		**6**	but - conj.	2
	important - adj.	1	**2x**	find - v.	5		years - n.	2
	team - n.	7		disease - n.	2		scientist - n.	8
	believe - v.	2		have - v.	1		find - v.	7
	cause - v.	1		variants - n.	1		fragments - n	1
	inability - n.	1		2. move			suggest - v.	8
	reduce - v.	1		detect - v.	6		already - adv.	1
				strong - adj.			smaller - adj.	2
				links - n.	1		become - v.	2
				variants - n.	2			
7	newfound - adj.		**8**	show - verb	11	**9**	adults - n	4
	measure - v.	3		listeners	2		successful- adj.	
	just - adv.	1		improvements	1		identify - v	13
	suggest - v.	9		ability	1		correct - adj.	
	link - n.	2		only	7		only - adv.	2
	but - conj.	3		students - n.	3		success - n.	
	provide - v	10		show - v.	12		very - adv.	
	evidence - n	1		improvement - n.	2		little - adv.	
	lead to - verb	3		enhance - v.	2		understanding-n.	
				effect - n.	1		but - conj.	4
				reduce - v.	2		find - v	14
							much - adv.	
							easier - adj.	
							understand- v.	1
10	help - v.	3	**11**	approach - n.	1	**12**	infants - n.	4
	surgeons - n.	9		appear - v.	15		variety - n.	3
	parts - n.	2		treatment - n.	2		scientists - n.	12

	cause - v. say - v. researcher - n.	4 3 10		older - adj. adults - n. components -n. say - v. researchers - n. believe - v. feature - n. effects - n. promote - v.	 5 3 4 11 3 1 2 3		but - conj. babies - n. produce - v. patterns - n. team - n.	5 6 2 2 13
13 **3x**	<u>1.move</u> scientists - n. believe - v. long - adj. year - n. <u>2. move</u> scientists - n. believe - v. <u>3. move</u> say - verb only - adv. find - v but - conj. largest - adj. length - n. high - adj. big - adj. short - adj.	 14 4 3 3 15 5 5 3 16 6 3 2 4 5 3	**14** **2x**	<u>1. move</u> research - n. lead to - v. treatment - n. disorders - n. say - v. expert - n. <u>2. move</u> work - v. produce - v. experiment - n. make - v. interesting - adj. finding - n.	 15 5 3 3 6 16 2 3 1 4 7 2	**15**	give - v. higher - adj. score - n. group - n.. have - v. good - adj. recently - adv. recovered - adj. medication - n. but - conj. think - v. results - n. people - n. factors - n.	17 6 7 2 2 4 7 6 3 8 4
16	discover - v. year - n. analysis - n. show - v. belong to - v. imply - v. most - adv. suggest - v. provide- v. clues - n.	17 4 2 18 19 20 21 2	**17**	result - n. lower - adj. low - adj. help - verb renewable - adj	4 4 5 4	**18**	finding - n. experiments - n. participants - n. suggest - v. integrate - v. various - adj.	5 3 9 22 2
19	researchers - n. propose - v. idea - n. new - adj. but - conj. show - v. evidence - n. support - v. say - v neuroscientist - n.	17 23 3 1 8 24 3 5 7 18	**20** **2x**	<u>1. move</u> say - v. help - v. train - v. <u>2. move</u> researchers - n. help - v. students - n. understand - v. already - adv. but - conj. only - adv. new - adj. say - v.	 8 6 19 7 10 2 2 9 4 2 9	**21** **2x**	<u>1. move</u> children - n. <u>2. move</u> say - v. included - adj. real - adj. children - n. but - conj. differences - n. find - v.	 11 10 12 10 3 25
22	researchers - n. identify - v. enough - adj process - n.	20 26 20	**23**	find - v. adolescents - n. more - adv. have - v amplify - v. increase degree - n. amplification-n. lead to - v	27 13 4 3 2 1 6	**24**	although groups - n. improve - v. trial - n. therapy - n. show - v. greater - adj. reduction - n. compare - v. medication - n.	9 14 4 4 5 28 7 1 6

							only - adv. average - n. lower - adj.	5 1 6
25	disease - n. modify - v. result in - v.	4 5 7	**26**	add - v. professor - n. children - n. disabilities - n. deficits - n. factor - n. to produce - v. effects - n.	11 21 15 5 6 5 6 3	**27**	new - adj. help - v. surgeons - n. operation - n. babies - n. defects - n.	3 8 22 5 16 7
28	professor - n. notice - v. samples - n. student - n. say - v.	23 29 3 24 12	**29**	study - n. announce - v. find - v. highly - adv. people - n. have - v. lower - adj. level - n.	6 13 30 17 4 7 2	**30** **2x**	1. move researchers- n. believe - v. help - v. solve - v. levels - n. have - v. less - adj. produce - v. 2. move result in - v.	 25 7 9 31 3 5 11 7 8
31	highest - adj. years - n. lower - adj. but - conj. develop - v. higher - adj. compare - v.	8 5 8 11 8 9 2	**32**	researchers - n observe - v. compare - v. large - adj. increase - n. average - n.	26 32 3 10 5 2	**33**	appear - v. team - n. elements - n. low - adj. but - conj. samples - n. high - adj.	33 27 6 9 12 4 11
34	although effective women - n. show - v. appear - v. develop - v.	13 18 34 35 9	**35**	find - v. average - n. reduction - n. induce - v.	36 3 9			

the overall number: 42 moves 1/3 = 14

table 6.1: Defined lexical signals in Move 5

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb + synonyms, hyponyms: find	36	lexical verb: say	16
noun (sg./pl) + synonyms, hyponyms: researcher	27	contrastive conjunction: but, although	13
noun(sg./pl.) + hyponyms: participant	18		

table 6.2: Synonyms and Hyponyms

lexeme	**synonyms**	**hyponyms**	**lexeme**	**synonyms**	**hyponyms**
find	discover, identify, notice, observe, detect	suggest, imply, appear, provide, promote, show, solve	say	add announce	
participants		mice, listeners,	researcher	scientist	paleontologist,

		students, adults, babies, infants, children, people adolescents, women			surgeon, neuroscientist, expert, professor, student

table 7: Analysis of Move 6

art.	lexeme	ordinal numb.	art.	lexeme	ordinal numb.	art.	lexeme	ordinal numb.
1	ways - n.	1	**2**	discovery - n.	2	**3**	<u>1. move a)</u>	
	discovery - n.	1		make - v.	1	**2x**	techniques	2
	say - v.	1		telescope-n	1		scientist	1
				look for - ph.v.	1		<u>1. move b</u>	
							clone	2
							researchers - n.	2
							collect - v.	1
							extract - v.	1
							cells - n.	
							mice - n.	1
							reconstruct-v.	3
							induce-v.	1
							development	3
							<u>2.move</u>	
							compare - v.	1
							groups - n.	2
							research - n.	1
							clone - v	4
							use - v.	1
4	researchers - n.	3	**5**	<u>1. move</u>		**6**	<u>1. move</u>	
	then-adv.	1	**2x**	study - n.	2		clues-n.	
	treat - v.	1		look at - v.	1		years-n.	1
	mice - n.	3		only - adv.	1		come - v.	1
				second - adj.			<u>2. move</u>	
				focus - v.	2		colleagues - n.	6
				first - adj.			pieces-n.	1
				colleagues - n.	4		years - n.	2
				sequence - v.			part-n.	2
				participants - n.	4		study - n.	4
				<u>2. move</u>			take-v.	1
				second - adj.			samples - n.	1
				study - n.	3		embed - v.	1
				researchers - n.	5		look for - v.	3
				lead by - v.	1		also - adv.	1
				analyse -v.	2		analyze - v.	5
				patients - n.	5		indicate - v.	2

				3. move				
				work - v.	3			
				compile - collect	2			
				analyse - v.	4			
				data - n.	1			
				needed - adj.				
				identify - v.	1			
				disease - n.				
7	paleontol. - n.	7	**8**	study - n.	5	**9**	1. move a)	
	reconstruct - v.	5		students - n.	6	**2x**	researchers -n.	8
	portions - n.	3		watch - partic.	1	**repe**	make -v.	6
				participants - n.	7	**titio**	recordings -n.	1
				ask - v.	1	**n**	mothers - n.	8
				extracts - n.	4		then - adv.	2
				new - adj.	1		1. move b)	
				excerpts - n.	5		researchers - n.	9
				take - v.	2		record - v.	7
				part - n.	6		ages - n.	1
							view - v.	2
							provoke - v.	2
							category - n.	7
							give - v	
							but - conj.	1
							ask - v.	2
							use - v.	2
							same - adj.	1
							convey - v.	
10	1. move		**11**	1. move		**12**	colleagues -n.	13
3x	researchers -n.	10	**2x**	study - n.	7		analyze - v.	7
	get - v.			colleagues - n.	12		recording - n.	2
	glimpse - n.			recruit - v.	1		babies	17
	implant - v.	2		patients - n.	12		make - v.	8
	send - v.			age - n.	2		study - n.	8
	2. move			years	3		researchers - n.	14
	ability	1		participants - n.	13		lower - adj.	1
	patients - n.	9		patients	14		higher - adj	1
	colleagues - n.	11		select - v.	1		pitches - n.	
	conduct - v.	2		ask - v.	3			
	simple - adj.	1		sessions - n.	1			
	experiments - n.	6		weeks - n.	1			
	participants - n.	10		include - v.	3			
	see - v.	3		minutes - n.	1			
	offer - v.	3		technique - n.	4			
	more - adv.	1		2. move				
	look - n.			participants - n.	15			
	technologies	3		control - adj.				
	3. move			group - n.	16			
	monitor - v.	6		session - n.	2			
	patients - n.	11		week - n.	2			
	simple - adj.	2		include - v.	4			
	look at - v.	3		minutes - n.	2			
	finally - adv.			final - adj.				
	use - v.	3		consist - v.	5			
				involve - v.	6			
13	sort - n.	8	**14**	researchers - n.	15	**15**	ask - v.	4
	ability - n.	2		use - v.	4		people - n.	19
	large - adj.	2		rat - n.	18		watch - v.	4
	then - adv.	5		test - v.	7		say - v.	2
	long - adj.	3		assess - v.	4		way - n.	2
	thin - adj.			ability - n.	3			
	small - adj.	2						

16	team - n. compare - v. structure - n.	16 2	**17**	researchers - n. create - v. then - adv. team - n. use - v. components - n.	17 9 6 18 5 9	**18**	ability - n. colleague - n. also study - v. figure out team - n. focus on - v. involve - v. participants - n. listen to - v. recordings - n. say - v. particip. indicate - v. groups - n. control - adj.	4 19 2 8 5 20 4 7 20 1 3 6 21
19	neuroscientist-n colleagues - n. use - v. rats - n. mice - n. get - v.	21 22 6 22 23	**20** **2x**	1. move choose - v. study - n. 2. move study - n. students - n. watch - v. minute- n. episode - n. same - adj. length take out - v parts - n. say - v. see - v.part. then - adv. new - adj.	 2 9 10 24 5 3 3 2 3 10 4 6 7 2	**21**	1. move psychologists - n. colleagues - n. say-v. ask - v. children-n. aged - adj. listen to-v. series-n. come-v. choose-v. make-v. 2. move part-n. study - n. also - adv. ask - v children - n. predict - v. same - adj. 3. move say - v. idea - n. study - n. come - v. watch - v.	 23 24 5 5 25 3 2 4 2 3 10 11 11 3 6 26 3 6 12 3 7
22	team - n. take - v. more - adv. approach - n. use - v. analysis - n. estimate - v. present(in) - v. test - v.	25 4 3 7 4 8 9	**23**	students - n. grades - n. recruit - v. study - n. participants - n. ask - v.	27 2 13 28 7	**24**	new-adj. study - n. RUPP group test - n. compare - v. involve - v. series - n. session - n. months - n. parents - n. reduce - v. enhance - v. include - v. children - n. ages - n. give - v. only - adv.	3 14 26 10 3 9 5 6 3 29 10 30 4 2
25	no M6		**26**	researchers - n. use - v. to scan - v.	27 8 12	**27** **2x**	1. move doctor - n. mitigate - v.	 28

				children - n.	31		surgeons -n.	29
				years - n.	4		then-adv.	8
				age - n.	5		develop - v.	12
				study - n.	15		new - adj.	4
				also - adv.	4		tool - n.	5
				establish - v.	11		2. move	
				abilities - n.	5		tool - n.	6
							first - adj.	
							use - v.	9
							data - n.	2
							to construct - v.	13
							model - n.	2
							then - adv.	9
							explore - v.	13
							doctors - n.	30
							reconstruction-n.	
							similar - adj.	3
28	1. move		**29**	1. move		**30**	colleagues-n.	33
2x	researcher - n.	31	**2x**	subjects-n.	32		look at-v.	5
	try - v.			ounces-n.			sample-n.	4
	make - v.	14		contain-v.	12		similar-adj.	4
	novel - adj.	5		doctor-n.	32		age-n.	6
	2. move			take-v.	5			
	degrees - n.			samples-n.	3			
	form - v.	13		participants-n.	33			
	structure - n.			week-n.	4			
	absorb - v.	11		study - n	16			
	ingredients			2. move				
	reflect - v.	15		study-n.	17			
	only - adv.	3		small-adj.	3			
	also - adv.	5		just-adv.	4			
	require - v.	8		people-n.	34			
	to stabilize - v.							
31	study-n.	18	**32**	adult-n.	37	**33**	1. move	
	enrol-v.	3		select-v.	4	**2x**	conduct-v.	3
	middle-aged-adj			miles-n.			experiment-n.	19
	adults-n.	35		week-n.	5		wine taster -n.	39
	patients-n.	36		most-adj.			offer - v.	7
	follow - v.			use-v.	10		varieties - n.	5
	years-n.	5		analysis - adj.			types- n.	6
	data-n.	3		system-n.			session - n.	7
	collect - v.	3		subject-n.	38		volunteers - n.	40
				observe-v.	13		samples - n.	7
				data-n.	4		most - adv.	2
				collect-v.	3		produce - v.	16
				period-n.	6		then - adv.	10
							researchers - n.	34
							analyze - v.	15
							2. move	
							team - n.	35
							double-check - v.	
							pieces	13
34	researchers - n.	36	**35**	researchers	37			
	recruit - v.	4		get - v.	4			
	women - n.	41		take - v.	6			
	volunteers - n.	42		samples - n.	10			
	receive - v			induce - v.	3			
	new - adj.	6		report - v.	7			
	series - n.	8		expose - v.				
	contain - v.	13		measure - v.				
	version - n.	8		effects - n.				

	produce - v. type - n. make - v	17 9 18		induce - v	

the overall number: 47 moves 1/3 = 15

table 7.1: Defined lexical signals in Move 6

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
noun(sg./pl.) + hyponyms: participant	42	lexical verb + synonyms, hyponyms: make	18
noun (sg./pl) + synonyms, hyponyms: researcher	37	lexical verb + synonyms, hyponyms: analyze	15
noun (sg./pl) + synonyms: study	19		

table 7.2: Synonyms and hyponyms of lexemes

lexeme	synonyms	hyponyms	lexeme	synonyms	hyponyms
participant		patient, people, volunteer, mothers, women, students, adults, babies, children mice, rat	researcher		doctor, paleontologists, colleagues, surgeon, team, RUPP group
study	experiment research		make	create, construct, reconstruct, develop, establish	clone, reflect produce
analyze	test, explore look for	observe, scan			

table 8: Analysis of Move 7

art.	lexeme	ordinal number	art.	lexeme	ordinal numb.	art.	lexeme	ordinal number
1	1.move		**2**	astronomer	6	**3**	1. move	
	scientists	1		say	6		obtain - v.	2
	say	1		results	3		researchers - n.	8
	data	1		support - v.	3		first - adj.	1
	collect - v.	1		theory	3		animal - n.	1
	story - n.	1		types	1		develop - v.	1
	previously	1		especially-adv.			correctly - adv.	
	believe - v.	1		exciting - adj.	1		scientists - n.	9
	tell - v.	2		discovery	4		use - v.	1
	project - n.	1		suggest - v.	5		species - n.	2
	anatomist - n.	2		team	7		however - conj.	2
	analysis - n.	2		indeed - adv.	1		2.move	
	reveal - v.	1		finding - n.	5		researchers-n.	10
	help - v.	1		record - n.			now - adv.	1
	but - conj.	1		really - adv.	2		show - v.	7
	also - adv.	1		show - v.	6		contribute - v.	4
	ability - n.	1		take			increase - n.	1
	indicate - v.	2		lead - n.			level - n.	1
	probably - adv.	1					use - n.	3
	2. move						however - conj.	3
	scientists - n.	3					very - adv.	1
	hypothesize - v.	2					first - adj.	2
	take - v.						use - v.	2
	different - adj.	1					research - n.	3
	trajectory - n.	1					focus on - v.	
	findings - n.	1					significantly-adv.	1

	help -v.	2					improve n.	1
	earlier - adj.	1					efficiency - n.	1
	belief - n.	2					raise - v.	1
	say - v.	3					3. move	
	3. move						experiments-n.	4
	revolutionize - v.	3					already-adv.	2
	way - n.	2					point -v.	8
	understand - v.	1					improvements-n	2
	earlier - adj.	2					development-n.	1
	part - n.	1					use - v.	3
	say - v.	4						
	team - n.	4						
	paleontologist-n.	5						
	4. move							
	finding - n.	2						
	point - v	4						
	say - v.	5						
4	1. move		**5**	1. move		**6**	team - n.	15
	professor-n.	11		teams - n.	14		detect - v.	12
	lead - v.			data - n.	2		associated - adj.	1
	team - n.	12		find - v.	11		also - adv.	3
	researchers - n.	13		variants - n.	3		find - v.	13
	find - v.	9		2. move			marked - adj.	
	affect - v.	1		better - adj.	1		increase - n.	2
	important - adj.	1		understanding - n	1		suggest - v.	14
	pathway - n.	4		involved - adj	1		use - v.	4
	study - n.	5		insight - n.	2		say - v.	8
	show - v.	10		causes - n.	2		2. move	
	increased - adj.	1		say - v.	7		interestingly-adv.	
	levels - n.	2					idea - n.	4
	reduced - adj.	1					also - adv.	4
	form - v.	2					support - v	7
	new - adj.	1					already - adv.	3
	2. move						researchers - n.	16
	rescue - v.	5					say - v.	9
	also - adv.	2						
	help - v.	6						
7	1. move		**8**	1.move		**9**	first - adj.	4
	bolster - v.	8		researchers - n.	20		demonstration-n	7
	idea - n.	5		find - v.	18		say - v.	15
	team - n.	17		associated - adj.	2		professor - n.	21
	paleontolog.- n.	18		previously - adv.	2		how - adv.	2
	discover - v.	15		new - adj.	4		but - conj.	7
	2.move			but - conj.	5			
	consider - v.	3		although - conj.	6			
	say - v.	10		also - adv.	6			
	provide - v.	16		enhance - v.	10			
	first - adj.	3		lead to - v.	1			
	early - adj	3		participants - n.	1			
	3. move			use - v.	5			
	indicate - v.	17		appear - v.	19			
	new - adj.	2		help - v	11			
	species - n.	4		decipher - v.	2			
	only - adv.	1		improved - adj.	2			
	but - conj.	4		2.move				
	also - adv.	5		listeners - n.	2			
	likely - adv.	2		use - v.	6			
	say - v.	11		how - adv.	1			
	4. move			way - n.	5			
	think - v.	4		happen - v.	1			
	only - adv.	2		too - adv.	7			

	now - adv.	4		make - v. cause	2			
	know - v.	1		students - n.	3			
	say - v.	12		provide - v.	20			
	5. move							
	leading - adj.							
	expert - n	19						
	say - v.	13						
	new - adj.	3						
	find - n.	6						
	fit - v.	1						
	perfectly - adv.							
	theory - n.	6						
	6.move							
	ability - n.	2						
	help - v.	9						
10	1.move		**11**	patients - n.	4	**12**	1. move	
	colleagues - n.	22		exhibit - v.	23		findings - n.	10
	find - v.	21		significant - n.	2		indicate - v.	25
	distinct - adj.	2		decrease - n.	1		already - adv.	5
	components - n.	2		use - v.	7		make - v. create	3
	also - adv.	8		researchers - n.	23		say - v.	19
	fit - v.	2		note - v.	18		perfect - adj.	4
	findings - n.	8		reduction - n.	2		development - n.	4
	show - v.	22		also - adv.	9		2.move	
	involved - adj.	2		observe - v.	24		researchers - n.	24
	production - n.	3		improved - adj.	3		know - v.	2
	happen - v.	2					difference - n.	1
	say - v.	16					but - conj.	9
	2. move						show - v.	26
	but - conj.	8					actually - adv.	3
	finding - n.	9					affect - v.	2
	theory - n.	7					stunning - adj.	2
	part - n.	3					point out - v.	27
	say - v.	17					ability - n.	3
							older - adj.	4
							studies - n.	6
							suggest - v.	28
13	1. move		**14**	1. move		**15**	1. move	
	think	5		extremely - adv.	2		volunteers - n.	5
	say - v.	20		surprised - adj.	3		find - v.	32
	find - n.	11		find - v.	30		better - adj.	6
	significant	3		only - adv.	4		but - conj.	11
	2. move			promote - v. help	12		ability - n.	4
	different	3		but - conj.	10		impair - v.	1
	types	5		cause - v.	3		sort - n.	6
	say - v.	21		say - v.	23		use - v.	8
	3. move			eventually - adv.			say - v.	26
	say - v	22		key - adj.	4		2. move	
	find - n.	12		suspect - n.	8		think - v.	8
	change - v.	2		also - adv.	10		say - v.	27
	understanding-n	3		nice - adj.	5		but - conj.	12
	really - adv.	4		discovery - n.	14		impact - v.	3
	show	29		believe - v.	7		now - adv.	6
	features	4		important- adj.	5		know - v.	3
	think	6		2. move			even - adv.	2
	only	3		professor - n.	25		affect - v.	4
	actually - adv.	5		say - v.	24		way - n.	7
	way	6		findings - n.	15			
	early - adj.	3		worthy - adj.	6			
	new	5		advantage - n.	3			

	discovery	13		benefit - n. obtain - v. even - adv. result - n. also suggest	4 3 1 16 11 31			
16	<u>1.move</u> find - v. species - n. think - v. improve - v. especially - adv. advantageous-adj. reduce - v. write - v. <u>2.move</u> theory - n. say - v. make - v. difference - n.	 33 7 9 2 2 28 9 28 4 3	**17**	innovative - adj important - adj. contribution - n. fact - n. say - v. add - v.	6 7 5 17 29 30	**18**	<u>1. move</u> very - adv. different - adj. ideas - n. study - n. researcher - n. tell - v. likely - adv. explanation - n. <u>2.move</u> abilities - n. view - v. <u>3. move</u> participants - n. indicate - v. show - v. experiment - n.	 3 4 10 7 26 31 3 4 5 34 6 35 36 8
19	new - adj. study - n. suggest - v. encode - v. <u>2. move</u> but - conj. animals - n. researchers - n. find - v. boost - v.help also - adv. <u>3. move</u> but - conj. new - adj. necessary - adj. say - v. findings - n. important - adj.	7 9 37 3 13 7 27 38 13 12 14 8 8 32 18 9	**20**	1. move help - v. <u>2. move</u> make - v.create say - v. linguist - n. even - adv. ability - n.	 14 4 33 28 3 6	**21**	<u>1. move</u> say - v. difference - n. suggestion - n. but - conj. <u>2. move</u> understand - v. very - adv. difficult - adj. use - v. better - adj. really - adv absorbed - adj. <u>3.move</u> say - v. better - adj. explain - v. strategy - n. <u>4. move</u> say - v. children - n. believe - v. child but - conj. know - v. really - adv. better - adj.	 34 4 15 4 4 9 7 6 3 35 8 39 8 36 8 10 16 4 7 9
22	surprised - adj. identify - v. variety - n. say - v. researcher - n. study - n. hypothesize - v. test - v. but - conj process - n. think - v. find - v.	4 40 8 37 29 10 11 1 17 12 41	**23**	<u>1.move</u> possible - adj. say - v. express - v. elicit - v. cause support - n. <u>2. move</u> factors - n. consider - v. researcher - n. integral - adj. component - n.	 1 39 46 5 6 5 13 30 4 6	**24**	results - n. show - v. parent - n. say - v. important - adj.	21 47 9 41 12

	research - n.	11		treatment - n.	10			
	suggest - v.	42		different - adj.	6			
	way - n.	9		although - conj.	18			
	fact - n.	19		stress - v.	40			
	levels - n.	3						
	2.move							
	contribute - v.	15						
	warn - v.	38						
	3. move							
	key - adj.	10						
	findings - n.	20						
	analysis - n.	12						
	available - adj.	2						
	diversity - n.	5						
	show - v.	43						
	species - n	9						
	present in - v.	1						
	testing - n.	13						
	likely - adv.	4						
	increase - v.	3						
	significantly	2						
	identify - v.	44						
	include - v.	2						
	significant - adj.	11						
	variability - n.	6						
	observe - v.	45						
	different - adj.	5						
25	1. move		**26**	1. move		**27**	1. move	
	factors - n.	7		find - v.	53		operation - n.	16
	express- v.	48		different - adj.	7		essentially - adv.	3
	levels - n.	4		show - v.	54		patient - n.	11
	lead to - v.	6		ability - n.	7		only - adv.	5
	show - v.	49		say - v.	43		2. move	
	processing - .	5		very - adv.	5		cardiologist - n.	32
	mice - n.	10		previous - asj.	6		develop - v.	5
	result in - v.	7		findings - n.	21		surgery - n.	17
	impairment - n.	3		suggest - v.	55		new - adj.	10
	suggest - v.	50		key - adj.	13		expected - adj.	5
	provide - v.	51		2. move			use - n.	10
	novel - adj.	9		previous - adj.			3. move	
	pathway - n.	11		research - n.	7		way - n.	12
	2. move			also - adv.	14		say - v.	44
	group - n.	31		show - v.	13		surgeons - n.	33
	suggest - v.	52		associated - ad.	56		test - v.	2
	impair - v.	4		parts - n.	3		evaluate - v.	6
	reinforce - v.	16		however - conj.	8		patterns - n.	9
	idea - n.	11		different - adj.	19			
				relate - v.	8			
				difficult - adj.	4			
				kinds - n.				
				involve - v.	10			
				findings - n.	3			
				demonstrate - v.	22			
				provide - v.	57			
				insight - n.	58			
				how - adv.	5			
				say - v.	3			
				help - v.	43			
				understand - v.	17			
				processing - n.	5			
				studies - n.	6			

					15			
28	prove - v. say - v. although - conj.	59 45 20	**29**	1. move find - v. levels - n. sample - n. 2. move result in - v. significant - adj. volunteers - n. only - adv. treatment - n. researchers - n. write - v. observable - ad. reduction - n. normalization - n levels - n. associated - adj. 3. move study - n research -n. show - v. elements - n. helpful - adj. benefit - n. previous - adj. find - v. help - v. reduce - v. 4. move key - n. contain - v. possible - adj.	 60 5 11 8 14 12 6 13 34 46 4 6 6 18 19 61 10 7 8 62 18 5 8 4 3	**30**	1. move find - v. 2. move colleagues - n. believe - v. key - n. difference - n. early - adj. propose - v. 3. move increases - n. change - v. result in - v.	 63 35 14 9 7 4 64 3 9
31	1. move study - n. likelihood - n. developing first - adj. approximately - adv. 2. move researchers - n. suspect - v. elevated - adj. relate to - v. people - n. use - v. results - n. also - adv. factor - n. types - n.	 20 7 5 5 36 15 2 7 13 11 23 14 11 12	**32**	1. move findings - n. confirm - v. provide - v. support - n effect - n. increased - adj. increase - n. likely - adv. cause - v. part - n. elevated - adj. characteristic - n 2. move write - v lead - adj. state - v. remarkably -adv. observe - v. even - adv. report - v. earlier - adv. greater - adj. significantly- adv. magnitude - n. indeed - adv. changes . n.	 24 19 65 10 3 4 6 10 12 4 13 47 48 4 66 4 49 5 9 5 11 8 8	**33**	1. move researchers - n. report - v. but - conj. suspect - v. release - v. 2. move surprised - adj. finding - n. say - v. lead - adj. think - v. components - n. represent - v. explain - v. induce - v. change - n. but - conj. new - adj. offer - v. opportunity - n. reconsider - v. 3. move say - v. enologist - n. better - adj. reasons - n. likely - adv.	 37 50 21 16 67 5 25 51 17 13 68 11 9 22 11 69 18 52 38 10 7

34	1. move		**35**	researchers - n.	40
	wonderful - adj.	6		show - v.	73
	demonstration-n	26		increased - adj.	5
	say - v.	53		levels - n.	7
	immunologist -n.	39		professor - n.	41
	but - conj.	23		lead - v.	
	only - adv.	7		research - n.	23
	testing - n.	21		say - v.	56
	establish - v.	7		patients	16
	2. move			but - conj.	26
	show - v.	70		only - adv.	8
	improvement-adj.	11		worth - n.	12
	participant - n.	14		investigate - v.	
	appear - v.	71		2. move	
	benefit - v.	20		research-n.	24
	but - conj.	24		study-n.	25
	3. move			say - v	57
	new - adj.	12		project - n.	27
	mobilize - v.			uncover - v.	74
	say - v.	54		pathways-n.	15
	result- v.	12		regulate-v.	7
	changes - n.	10		3. move	
	induce - v.	13		interesting-adj.	7
	produce - v.	8		research - n.	26
	contribute - v.	21		use - v.	13
	however - conj.	25		new - adj.	14
	make - v.create	9		know - v.	5
	serve - v.	12			
	attract - v.	4			
	4. move				
	new - adj.	13			
	way - n	14			
	develope - v.	10			
	women - n.	15			
	benefit - v.	22			
	study - n.	22			
	show - v.	72			
	say - v.	57			
	stimulate - v.	6			
	production - n.	7			
	make - v.	11			
	very - adv.	5			

the overall number: 82 moves 1/3 - 27

table 8.1: Defined lexical signals in Move 7

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb + synonyms, hyponyms: find	74	noun (sg./pl) + synonyms: study	26
lexical verb + synonyms, hyponyms: say	57	contrastive conjunctions: but, however, although	25
noun (sg./pl) + synonyms, hyponyms: researcher	41	noun (sg./pl.) + synonyms: findings	26

table 8.2: Synonyms and hyponyms

lexeme	synonyms	hyponyms	lexeme	synonyms	hyponyms
lexical verb:	uncover,	explain, suggest,	noun(sg./pl.):	scientist	team, group,

find	release, identify, observe, indicate, point out, detect, discover, prove	propose, express show, appear, provide,	researcher		paleontologist, linguist, experts, professor, enologists, cardiologist, surgeons
lexical verb: say	tell, report, add, state, note,	warn, write, stress	noun (sg./pl.): study	research, analysis, testing, experiment	project, operation, surgery
noun (sg./pl.): finding	result, discovery, fact demonstration				

table 9: Analysis of Move 8

art.	lexene	ordinal numb.	art.	lexene	ordinal numb.	art.	lexene	ordinal numb.
1	certain - adj. cause - v. considerable - adj. rethinking - n. only - adv. but - conj. also - adv. say - v. professor - n.	1 1 1 1 1 1 1 1	**2**	no Move 8		**3**	studies - n. researchers - n. only - adv. apply - v. reproduce - v. animals - n. also - adv. use -v. reprogramming- n. therapeutic- adj. aims - n.	1 2 2 1 1 1 2 2 1 1
4	say - v.	2	**5**	hope - v.	1	**6**	tell - v.	3

	work - n. identify - v. treatment - n. mice - n. impact - n. further - adv. specific - adj. changes - n. cause - v. future - adj. target - n. reveal - v. novel - adj. therapeutic - adj. approaches - n. treat - v. deficits - n. disturbance disease - n.	2 1 1 2 1 2 2 1 2 2 1 2 2 1 1 2 3		new - adj. understanding-n. provide - v. strategies - n. prevent - v. disease - n.	3 1 3 2 1 4		add - v. archaeologists learn - v.	4 3
7	discovery - n. help - v. paleontol. - n. new - adj. details - n. say - v. study - n. today - adv. build - v.	2 2 4 3 1 5 4 1 2	**8**	findings - n. also - adv. have - v. implications - n. help - v. perhaps - adv. use - v. available - adj. boost - v. learning - n. moreover - adv. make - v. optional - adj. interfere - v. viewer - n.	3 3 3 3 4 2 3 3	**9**	no Move 8	
10	research - n. answer - v. how - adv. generate - v. just - adv. tell - v. take - v. study - n. further - adj. detail - n.	5 5 1 4 3 6 6 2 2	**11**	observations - n. emphasize - v. need - n. further - adv. evaluate - v. mechanism - n. approaches - n. extend - v. benefits - n. conclude	4 3 6 3 1 7	**12**	say - v. next - adj. step - n. compare - v. also - adv. look at - v. how - adv. study - n. but - conj. already - adv.	8 3 1 4 2 7 1 2
13 **13**	discovery - n. make - v. scientists - n. think - v. help - v. explain - v. how - adv.	5 5 5 2 5 7 4	**14** **2x** **14**	<u>1. move</u> make - v. treatment - n. option - n. disorders injury <u>2. move</u> now - adv. test - v. how - adv. aim - v. uncover - v. targets - n. better - adj. understand - v. mechanism - n. lead to - v.	 6 4 5 6 3 1 3 1 8 6 1 1 3	**15** **15**	commentary - n. study - n. propose - v. offer - v. therapy - n. say - v. possible - adj. but - conj. increase - v.	 8 9 10 5 9 1 2 1

				protect - v. promote - v. help regrowth - n. say - v.	6 7 6 9			
16	no move9		**17**	also - adv. help - v. reduce - v. use - v. make - v. provide - v. support - n. further - adv.	5 8 1 4 7 11 2 4	**18**	next - adj. work - v. scientists - n. figure out - v. how - adv.	6 2 6 12 5
19	essentially - adv. new - adj. aid - v. formation - n. add - v. - say novel - adj. represent - v. researchers - n.	 4 9 10 5 12 7	**20**	recommend - v. speakers - n. results - n. need - v. campaign-n. say - v. psycholinguist-n. study - n. good - adj. how - adv. become - v. way - n.	10 4 6 11 8 9 2 6 4 6	**21**	plan - v. conduct - v. further - adj. studies - n. assess - v. children - n use - v. strategies - n. mechanism - n.	2 1 4 10 13 5 5 7 2
22	now - adv. show - v. conduct - v. follow-up - adj. research - n.	4 14 2 5 11	**23**	no Move 8		**24**	RUPP group - n. expect - v. launch - v. study - n. disorders - n. hope - v. show - v. problems - n. reduce - v. children - n. start - v. say - v. future - adj. also- adv. look for - v. ways - n. use - v.	9 3 1 12 7 4 15 8 2 6 2 12 6 6 2 8 6
25	no Move 8		**26**	ultimately - adv. better - adj. understanding-n. underlying - adj. cause - n. deficits - n. lead to - v. treatment - n. improved - adj.	 7 6 9 5 9	**27**	ultimate - adj. goal - n. optimize - v. tailor -v. patients - n. say - v.	 4 7 13
28	researchers - n. replace - v.	10	**29**	no Move 8		**30**	work - n. colleagues - n. provide - v. method - n. search - v. possibly - adv.	13 11 16 10 3
31	colleagues - n. findings - n. patients - n. especially - adv. recommend - v.	12 8 8 1 14	**32**	conclude - v. reduce - v. provide - v. especially - adv. goal - n.	15 3 17 2 6	**33**	no Move 8	

	consider - v. countermeasures-n. use - n. therapy - n. key - adj. step - n. screening - n. assure - v. detection - n	5 11 2 5 2 9		new - adj. design - n.	6			
34	now - adv. goal - n. use - v. new - adj. say - v. team - n. already - adv. work - v. trial - n.	5 7 7 7 16 13 6 4 14	**35**	<u>1. move</u> research - n. study - n. say - v. uncover - v. <u>2. move</u> have - v. prevent - v find - v. new - adj treatment - n. major - adj. step - n. forward - adv. <u>2. move</u> consider - v. raise - v. new - adj. needed - adj.	 15 16 17 18 2 19 8 12 3 3 5 5 2 9			

the overall number: **29 moves** **1/3 - 9**

table 9.1: Defined lexical signals in Move 8

Lexeme/group of lexemes	Number of occurrences	Lexeme/group of lexemes	Number of occurrences
lexical verb +synonyms, hyponyms : show	19	noun (sg./pl.) + synonyms, hyponyms : treatment	12
lexical verb +synonyms: say	17	lexical verb +synonyms, hyponyms : help	9
noun + synonyms : study	16	noun (sg./pl.)+ synonyms, hyponyms : findings	9
noun(sg./pl.) + its synonyms, hyponyms : researcher	13	adjective: new	9

table 9.2: Synonyms and hyponyms

lexeme	synonyms	hyponyms	lexeme	synonyms	hyponyms
show	provide, figure out, uncover	assess, offer, identify, explain,answer	researcher	scientist	group, colleague, palaeontologist, psycholinguistic, team, archaeologist, professor
study	research, trial, work		say	add, conclude, recommend	
help	protect, aid, promote, boost, treat		finding	discovery, result, detection	understanding
treatment	therapy, approach	strategy, method, way			

Appendix n.2: Data sources

number 1

Oldest human skeleton offers new clues to evolution

By Azadeh Ansari

CNN **(CNN)** -- The oldest-known hominid skeleton was a 4-foot-tall female who walked upright more than 4 million years ago and offers new clues to how humans may have evolved, scientists say.

Scientists believe that the fossilized remains, which were discovered in 1994 in Ethiopia and studied for years by an international team of researchers, support beliefs that humans and chimpanzees evolved separately from a common ancestor.

"This is not an ordinary fossil. It's not a chimp. It's not a human. It shows us what we used to be," said project co-director Tim White, a paleontologist at the University of California, Berkeley.

Ardipithecus ramidus, nicknamed "Ardi," is a hominid species that lived 4.4 million years ago in what is now Aramis, Ethiopia. That makes Ardi more than a million years older than the celebrated Lucy, the partial ape-human skeleton found in Africa in 1974.

Ardi's 125-piece skeleton includes the skull, teeth, pelvis, hands and feet bones. Scientists say the data collected from Ardi's bone fragments over the past 17 years push back the story of human evolution further than previously believed.

"In fact, what Ardipithecus tells us is that we as humans have been evolving to what we are today for at least 6 million years," C. Owen Lovejoy, an evolutionary biologist at Kent State University and project anatomist, said Thursday.

Analysis of Ardi's skeleton reveals that she weighed about 110 pounds, had very long arms and fingers, and possessed an opposable big toe that would have helped her grasp branches while moving through trees.

Ardi's brain was believed to be the size of a chimp's, but she also had many human-like features, such as the ability to walk upright on two legs. Her "all-purpose type" teeth indicate that she probably ate a combination of plants, fruits and small mammals, scientists say.

"The anatomy behind this behavioral combination is very unexpected and is certain to cause considerable rethinking of not only our evolutionary past, but also that of our living relatives: the great apes," said Alan Walker, professor of biological anthropology at Pennsylvania State University.

Many scientists hypothesize that humans took a different evolutionary trajectory from those of chimpanzees, bonobos and gorillas. Ardi's findings help challenge earlier beliefs that humans evolved from chimpanzees, their closest genetic relatives, scientists say.

Researchers are still trying to pinpoint when the two lineages -- chimps and humans -- split from their common ancestor.

Digging up the past has not been easy.

Scientists stumbled upon the Ardipithecus fossil in 1994 when a graduate student found a single upper molar tooth. The rest of Ardi's fossilized bones, sandwiched between layers of volcanic rock, took three years to be recovered and many more to be analyzed.

"In many ways, the discovery of Ardipithecus has been like a marathon," White said.

"Ardipithecus ramidus and its prevailing anatomy revolutionize the way most of us understood the earlier part of our evolutionary history," said team member Yohannes Haile-Selassie, paleontologist at the Cleveland Museum of Natural History.

The Ardi findings are the work of 47 paleontologists and geologists representing 10 countries. The results will be published Friday in 11 articles in a special edition of the journal Science.

Until now, Australopithecus, nicknamed "Lucy," was the oldest fossil studied by scientists seeking to explain human evolution. Lucy is believed to have lived about 3.2 million years ago in what is now Ethiopia.

Many scientists credit Ethiopia with taking the lead in helping the world better understand the origins of humans.

"This finding points to a deeper sense of our [humans'] interconnectedness," Samuel Assefa, Ethiopian ambassador to the United States, said Thursday. "We are all Ethiopians at heart."

Ardi's skeleton resides in the National Museum of Ethiopia in Addis Ababa.

SFGate.com

Europeans find 32 new planets outside solar system

By SETH BORENSTEIN, AP Science Writer
Monday, October 19, 2009
(10-19) 17:46 PDT WASHINGTON, (AP) --

European astronomers have found 32 new planets outside our solar system, adding evidence to the theory that the universe has many places where life could develop. Scientists using the European Southern Observatory telescope didn't find any planets quite the size of Earth or any that seemed habitable or even unusual. But their announcement increased the number of planets discovered outside the solar system to more than 400.

Six of the newly found planets are several times bigger than Earth, increasing the population of so-called super-Earths by more than 30 percent. Most planets discovered so far are far bigger, Jupiter-sized or even larger.

Two of the newly discovered planets were as small as five times the size of Earth and one was up to five times larger than Jupiter.

Astronomer Stephane Udry of the University of Geneva said the results support the theory that planet formation is common, especially around the most common types of stars.

"I'm pretty confident that there are Earth-like planets everywhere," Udry said in a Web-based news briefing from a conference in Portugal. "Nature doesn't like a vacuum. If there is space to put a planet there, there will be a planet there."

What astronomers said is especially exciting is that about 40 percent of sun-like stars have planets that are closer to being Earth-sized than the size of Jupiter. Jupiter's mass is more than 300 times that of Earth's.

Depending on definitions of the size of super-Earths, the discovery suggests that planets that have a mass similar to Earth's are "extraordinarily commonplace," said Alan Boss, an astronomer at the Carnegie Institution of Washington. He was not part of the European team. "The universe must indeed be crowded with habitable worlds."

Boss said finding 32 planets at once is a record "and it really shows that the Europeans have taken the lead" in finding planets outside the solar system.

The discoveries were made by the High Accuracy Radial Velocity Planet Searcher, which is an attachment to the European observatory telescope in Chile that looks for slight wobbles in a star's movements. Those changes would be made by the tug of a planet's gravity on the star. There are no photos of these planets.

number 3

Mice Cloned In Spain

ScienceDaily (June 12, 2009) — Researchers at the Department of Cell Biology, Physiology and Immunology at Universitat Autònoma de Barcelona (UAB) are the first to have cloned mice in Spain. Cloe, Cleo and Clona are three female brown-coloured mice and were born respectively on 12 May, 3 June and 10 June. By means of nuclear transfer techniques, scientist collected mature oocytes, removed their chromosomes and substituted them for the nucleus of an adult somatic cell. The cloning of mice is part of a research being carried out to study new ways to improve the efficiency of the cloning process. All three mice were or are being suckled with other non-clones and their growth parameters are within normal range, say researchers who were in charge of cloning the mice, Nuno Costa-Borges, Josep Santaló and Elena Ibáñez from the Department of Cell Biology, Physiology and Immunology at UAB.

In order to clone the animals, researchers collected oocytes and surrounding cumulus cells from several female mice. The chromosomes were extracted from each of the oocytes and substituted with a cell from the cumulus by cytoplasm injection. Once the oocytes had been reconstructed, they were activated by simulating the stimuli occurring during fecundation so as to induce embryonic development. The cloned embryos were later transferred to receptor females.

The mice obtained by researchers at UAB, in addition to being the first of their species cloned in Spain, are the first animals to survive at birth and develop correctly. In 2003, Spanish scientists were able to clone a female Pyrenean mountain goat using a cell from the last animal of this species, which became extinct in 2000. The cloned animal however died 10 minutes after it was born due to a severe lung defect.

Increase in the efficiency of the cloning process

The cloning of the mice forms part of a research which scientists at UAB are carrying out to discover new ways of improving the efficiency of the cloning process. Nuno Costa-Borges, Josep Santaló and Elena Ibáñez are studying whether the use of valproic acid could contribute to an increase in the success rate of nuclear transfer cloning, currently situated at approximately 1% for mice using standard procedures.

Valproic acid is an inhibitor of the enzyme histone deacetylase, located at the cell nucleus where the DNA is found. Research carried out until now has shown that histone deacetylase inhibitors seem to contribute to an increase in levels of gene expression, which would favour the reprogramming of the somatic cell nucleus transferred to the oocyte cytoplasm. Its use in nuclear transfer processes however is very recent. It was first used two years ago and research until now has focused on trichostatin, an inhibitor which has significantly improved the efficiency of mouse cloning, raising it to 5%.

Studies carried out by researchers at UAB can not only be applied to reproductive cloning of animal models; they can also be used for the reprogramming of cells for therapeutic aims.Costa-Borges, Santaló and Ibáñez are comparing three groups of cloned embryos in their research: valproic acid in the first group, trichostatin in the second and no inhibiting substance in the third group. The three mice in this case were cloned using the first (Cloe and Clona) and second (Cleo) inhibitors. In vitro experiments already pointed to improvements in the development of cloned embryos using inhibitors. However, scientists must wait until the end of the in vivo test period in July to obtain more conclusive data.

number 4

Fighting Sleep: Researchers Reverse Cognitive Impairment Caused By Sleep Deprivation

Sleep deprivation can have cognitive consequences, including learning and memory deficits, but the mechanisms by which sleep deprivation affects brain function have remained unknown. (Credit: iStockphoto/Nicole Waring)

ScienceDaily (Oct. 27, 2009) — A research collaboration led by biologists and neuroscientists at the University of Pennsylvania has found a molecular pathway in the brain that is the cause of cognitive impairment due to sleep deprivation. Just as important, the team believes that the cognitive deficits caused by sleep deprivation, such as an inability to focus, learn or memorize, may be reversible by reducing the concentration of a specific enzyme that builds up in the hippocampus of the brain.

It is known that sleep deprivation can have cognitive consequences, including learning and memory deficits, but the mechanisms by which sleep deprivation affects brain function remain unknown. A particular challenge has been to develop approaches to reverse the impact of sleep deprivation on cognitive function.

The findings, reported in this week's issue of the journal *Nature*, could present a new approach to treating the memory and learning deficits of insomnia. A molecular mechanism by which brief sleep deprivation alters hippocampal function is now identified in mice, involving the impairment of cyclic-AMP- and protein-kinase-A-dependent forms of synaptic plasticity, or readiness for cognitive function.

Ted Abel, principal investigator and professor of biology in the School of Arts and Sciences at the University of Pennsylvania, led the international team of researchers that found that sleep deprivation in mice affects an important molecular pathway in the hippocampus, a region of the brain known to be important for memory and learning. The study showed that mice deprived of sleep had increased levels of the enzyme PDE4 and reduced levels of the molecule cAMP, the latter of which is crucial in forming new synaptic connections in the hippocampus, a physiological hallmark of learning.

Researchers then treated the mice with PDE inhibitors, which rescued the sleep deprivation-induced deficits in cAMP signaling, synaptic plasticity and hippocampus dependent memory. This reversal also helped to rescue deficits in synaptic connections in the hippocampus and therefore counteract some of the memory consequences of sleep deprivation.

"Millions of people regularly obtain insufficient sleep," Abel said. "Our work has identified a treatment in mice that can reverse the cognitive impact of sleep deprivation. Further, our work identifies specific molecular changes in neurons caused by sleep deprivation, and future work on this target protein promises to reveal novel therapeutic approaches to treat the cognitive deficits that accompany sleep disturbances seen in sleep apnea, Alzheimer's disease and schizophrenia."

The study was supported by the National Institutes of Health, the Human Frontier Science Program, the Netherlands Organization for Scientific Research, a Medical Research Council (U.K.) grant, a European Union grant, the Fondation Leducq and a U.K. Engineering and Physical Sciences Research Council training grant.

number 5

News in Science

Five genes linked to Parkinson's disease

Monday, 16 November 2009
Reuters

People of Japanese and European descent who have mutant versions of five genes may be at higher risk of developing Parkinson's disease, two large teams of researchers have found.

The two independent studies, published in the latest issue of *Nature Genetics*, involved a total of more than 25,000 participants, and are the largest studies to date to try to uncover genetic associations behind Parkinson's disease.

A study in Japan looked only at ethnic Japanese while a second study, in the US, focused only on people of European heritage.

In the first study, Dr Tatsushi Toda of Japan's Kobe University and colleagues sequenced the genes of 2,011 participants with the disease and 18,381 others without the disease.

They found that those with the disease had variants of the genes PARK16, BST1, SNCA and LRRK2.
In the second study, researchers led by Dr Andrew Singleton at the National Institutes of Health's (NIH) laboratory of neurogenetics in the US analysed the genes of more than 5,000 patients of European ancestry who suffer from the disease and detected strong links between Parkinson's and variants of the genes SNCA and MAPT.

The two teams later compared their data and found that variants of PARK16, SNCA and LRRK2 carry risk of Parkinson's in both Japanese and European populations, while variants of BST1 and MAPT were population-specific.
"Because previous Parkinson's genome-wide association studies were too small and lacked power, we worked together to compile and analyse the large data sets needed to identify the elusive genetic variations that play a role in this complex disease," says Singleton.

Parkinson's is a neurodegenerative disease that affects one to 2% of people over the age of 65. It is characterised by tremors, sluggish movement, muscle stiffness, and difficulty with balance.

Although medical treatments may improve symptoms, there are none that can slow down or halt the progression of the disease.

"With this better understanding of the underlying genetic variants involved in the progress of this disorder, we have more insight into the causes and underlying biology of this disease," says Singleton.

"We hope this new understanding will one day provide us with strategies to delay, or even prevent, the development of Parkinson's disease."

number 6

LIVE SCIENCE.

Evidence Alexander the Great Wasn't First at Alexandria

By Andrea Thompson, Senior Writer
posted: 23 October 2009 02:34 pm ET

Alexander the Great has long been credited with being the first to settle the area along Egypt's coast that became the great port city of Alexandria. But in recent years, evidence has been mounting that other groups of people were there first.
The latest clues that settlements existed in the area for several hundred years before Alexander the Great come from microscopic bits of pollen and charcoal in ancient sediment layers.

Alexandria was founded by Alexander the Great in 331 B.C. The city sits on the Mediterranean coast at the western edge of the Nile delta. Its location made it a major port city in ancient times; it was also famous for its lighthouse (one of the Seven Wonders of the Ancient World) and its library, the largest in the ancient world.
But in the past few years, scientists have found fragments of ceramics and traces of lead in sediments in the area that predate Alexander's arrival by several hundred years, suggesting there was already a settlement in the area (though one far smaller than what Alexandria became).

Christopher Bernhardt of the U.S. Geological Survey and his colleagues took sediment cores (long cylindrical pieces of sediment drilled from the ground) that featured layers going as far back as nearly 8,000 years ago as part of a larger climate study of the area.
In these sediment layers, Bernhardt and his colleagues took samples of embedded ancient pollen grains to look for shifts from primarily native plants to those associated with agriculture. They also analyzed levels of microscopic charcoal, whose presence can indicate human fires.

At a mark of 3,000 years ago, Bernhardt's team detected a shift in pollen grains from native grasses and other plants to those from cereal grains, grapes and weeds associated with agriculture. They also found a marked increase in charcoal particles, all of which suggests that a settlement pre-dated the great city of Alexandria.
"They're definitely using the landscape," Bernhardt said.

Interestingly, this idea is also supported in the stories of Homer: In Book 4 of "The Odyssey," there's a mention of a one-day sail from the coast near the Nile to the nearby island of Pharos. This suggests that a port settlement of some sort was already there, the researchers say.

number 7

New "Mini" Dinosaur a Step in Bird Evolution Path

Kevin Holden Platt
for National Geographic News

September 6, 2007

An 80-million-year-old fossil recently uncovered in the Gobi desert could be a key piece of the evolutionary puzzle of how massive dinosaurs gave rise to today's comparatively tiny birds, paleontologists say.
The newfound species, dubbed *Mahakala omnogovae,* measures just 27.5 inches (70 centimeters) from its head to the tip of its feathered tail.
Dinosaur digs over the last decade—including many in China—have suggested that several of the ancient reptiles were covered in feathers, a hint of their potential link to birds.

(Related: "Massive Birdlike Dinosaur Unearthed in China" [June 13, 2007].)
But few of the fossils have provided direct evidence of the evolutionary changes that led to flight.
Mahakala's small size bolsters the idea that some theropods, or bipedal carnivorous dinosaurs, decreased in stature during the evolutionary transition into birds, according to the team of paleontologists who discovered the young adult fossil.
"Miniaturization has long been considered crucial to the origin of flight," said Alan Turner of New York's American Museum of Natural History.
"Now *Mahakala* is providing the first signs of some of these early evolutionary steps."
Turner and colleagues will present their findings in tomorrow's issue of the journal *Science.*

Tiny Protector

The *Mahakala* fossil was found in the southern part of the Gobi in Mongolia and was named after a Tibetan Buddhist protector deity.
Paleontologists reconstructed *Mahakala* based on fossilized portions of the dinosaur's skull and limbs along with most of its spinal column.
The fossils indicate that the new species was not only feathered but also likely had winglike forelimbs and hind limbs, Turner said.
Mark Norell is a study co-author and curator at the natural history museum's division of paleontology.
"Many of the animals that were thought to look like giant lizards only a few years ago are now known to have been feathered and to have had many other defining bird characteristics," Norell said.
Mahakala is an offshoot of the group of meat-eating dinosaurs known as dromaeosaurids, which includes the *Velociraptor* featured in the 1993 movie *Jurassic Park.*
If Steven Spielberg were to make another *Jurassic Park* sequel, Turner noted, many of the dinosaurs that starred in the original film would require a complete makeover.
"The *Velociraptor* would be completely covered in feathers," he said.

Bird Survival

Xu Xing, one of China's leading dinosaur hunters and an expert on the evolution of feathered dinosaurs, said that the new find fits perfectly into the theory that dinos evolved into birds.
"The discovery of *Mahakala* and other small birdlike dinosaurs is helping paleontologists paint new details on the mosaic depicting the first flight-capable birds' ascent from nonavian dinosaurs," said Xu, who was not involved in the new study.
Today consensus is building among paleontologists that dinosaurs and birds are linked.
But the experts disagree over how that evolutionary twist helped ancient birds escape being wiped out with the rest of the dinosaurs 65 million years ago.
"Paleontologists really don't know the answer to that. Why some animals survive mass extinctions while others don't is one of the most difficult questions in paleontology," lead study author Turner said.
"Flying doesn't seem to have hurt birds, yet pterosaurs—which are not dinosaurs—flew but went extinct."
Xu added that a combination of birds' ability to fly and to evolve quickly might have helped them survive.
"Birds mature within one year, and that gives them the means to adapt very rapidly to big changes in the environment," he said.
"They evolve much more quickly than massive dinosaurs or human

number 8

Foreign Subtitles Improve Speech Perception

ScienceDaily (Nov. 11, 2009) — Do you speak English as a second language well, but still have trouble understanding movies with unfamiliar accents, such as Brad Pitt's southern accent in Quentin Tarantino's Inglourious Basterds? In a new study, published in the open-access journal *PLoS One,* Holger Mitterer (Max Planck Institute for Psycholinguistics) and James McQueen (MPI and Radboud University Nijmegen) show how you can improve your second-language listening ability by watching the movie with subtitles -- as long as these subtitles are in the same language as the film. Subtitles in one's native language, the default in some European countries, may actually be counter-productive to learning to understand foreign speech.

Mitterer and McQueen show that listeners can tune in to an unfamiliar regional accent in a foreign language. Dutch students showed improvements in their ability to recognise Scottish or Australian English after only 25 minutes of exposure to video material. English subtitling during exposure enhanced this learning effect; Dutch subtitling reduced it.

In the study, Dutch students who were unfamiliar with Scottish and Australian English watched either an episode of the Australian sitcom Kath & Kim or a shortened version of Trainspotting, which depicts a Scottish drug addict, Renton, and his friends -- with English subtitles, Dutch subtitles or no subtitles. After this exposure, participants were asked to repeat back as many words as they could from 80 audio excerpts taken from each source spoken by the main characters (Kath from Kath & Kim; Renton from Trainspotting), half of which had already been heard by the participants in the extracts and half were new to the participants (from a different Kath & Kim episode or from a part of Trainspotting that was edited out).

The researchers found that English subtitles were associated with the best performance on both previously heard and new material but although Dutch subtitles also enhanced performance on the old items, they led to a worse performance on the new materials. The participants seemed to be using the semantic (meaning-based) information in the Dutch subtitles when listening to the English speech and so the Dutch subtitles appear to have helped the participants to decipher which English words had been uttered, as seen in the improved recognition of previously heard materials. This did not, however, allow participants to retune their phonetic categories so as to improve their understanding of new utterances from the same speaker.

Listeners can use their knowledge about how words normally sound to adjust the way they perceive speech that is spoken in an unfamiliar way. This seems to happen with subtitles too. If an English word was spoken with a Scottish accent, English subtitles usually told the perceiver what that word was, and hence what its sounds were. This made it easier for the students to tune in to the accent. In contrast, the Dutch subtitles did not provide this teaching function, and, because they told the viewer what the characters in the film meant to say, the Dutch subtitles may have drawn the students' attention away from the unfamiliar speech.

These findings also have educational implications. Since foreign subtitles seem to help with adaptation to foreign speech in adults, they should perhaps be used whenever available (e.g. on a DVD) to boost listening skills during second-language learning. Moreover, since native-language subtitles interfere with this kind of learning, such subtitles in television programmes should be made optional for the viewer.

This work was funded by the Max-Planck-Gesellschaft zur Förderung der Wissenschaften.

The New York Times
nytimes.com
August 28, 2007

Baby Talk Crosses Cultural Line

By NICHOLAS BAKALAR

It may be that when adults talk to babies, they use a language that is universally understood.

Researchers made recordings of English-speaking mothers talking to babies and to adults, then played them to residents of a Shuar village in Morona Santiago Province in southeastern Ecuador. The Shuar are an indigenous group of hunter-horticulturalists who had been taught Spanish but have their own language, and the scientists wanted to see if they could understand the meaning, even without understanding any of the words, when adults talked to babies in English.

The researchers recorded four utterances from each of eight English-speaking mothers, ages 21 to 51. The mothers viewed pictures of babies to provoke speech suggesting one of four categories of meaning: prohibition, approval, comfort or paying attention. They were given no script, but were asked to speak as if they were talking to their own baby, using the same phrasing and intonation.

Then the women were recorded conveying the same meanings as if speaking to an adult.

The 26 Shuar young adults were successful about three-quarters of the time in determining whether an adult or a child was being addressed. With adult speech, they identified the correct meaning category 64 percent of the time, with only moderate success in identifying attention and comfort, and very little in understanding prohibition and approval.

But when English-speaking adults talked to babies, the Shuar found it much easier to understand. They succeeded an average of 75 percent of the time in distinguishing the four meanings, with success rates of 78 percent in identifying attention and 86 percent in understanding prohibition. The report appears in the August issue of Psychological Science.

“This is the first empirical demonstration that in a nonliterate, nonindustrialized indigenous culture, people are able to recognize meaning in a language they don’t speak,” said Gregory A. Bryant, a co-author of the paper and an assistant professor of communications at the University of California, Los Angeles. “There is variability across cultures in how much people talk to babies, but when they do, they tend to sound very much alike.”

number 10

Speed of Thought-to-Speech Traced in BrainBy Andrea Thompson

posted: 15 October 2009 02:06 pm ET

In just 600 milliseconds, the human brain can think of a word, apply the rules of grammar to it and send it to the mouth to be spoken. For the first time, researchers have traced this lightning-fast sequence and broken it down into distinct steps.

Researchers got this rare glimpse into the fine-tuned workings of the brain from the signals sent by electrodes implanted in the brains of epileptics. The electrodes help surgeons locate the parts of the brain that cause epileptic seizures so they can be removed, and also help keep surgeons from removing critical parts of the brain

"If you go a few millimeters to the right or left, you might delete their piano lessons or language ability, and that would be sorely missed," said Ned Sahin of Harvard University, one of the researchers who studied the language network.

Because the electrodes are already monitoring language ability in these patients, Sahin and his colleagues can conduct simple language experiments with willing participants and see language processing in real time; essentially, the electrodes offer a more fine-grained look at neural processes than other traditional brain-monitoring technologies, such as MRIs.

The language center

The main brain region Sahin and his colleagues looked at is called the Broca's area, located in the cerebral cortex. This region was discovered to be involved in language processing by the French physician Pierre Paul Broca in 1865.

But beyond knowing that the area is important to language production, "we still have been troublingly unable to pin it down," Sahin said. Whether or not the steps of the language production process happen in parallel or sequentially has been one particularly puzzling question about the brain.

The new electrode study, detailed in the Oct. 16 issue of the journal Science, has set scientists one step closer to understanding the steps of language production in the brain, specifically word recall, the application of grammar (changing tense or number), and actually speaking the word.

By monitoring the brains of three patients while they performed a simple language task (looking at a word, then either using it in a sentence as is or changing its tense or number, and finally articulating it silently), Sahin and his colleagues found three distinct periods of activity in Broca's area at 200 milliseconds (after first being presented with the word), 320 milliseconds and 450 milliseconds.

These three spikes corresponded to the three basic components of language: words, grammar and phonology (the organization of sound). All three also fit within the roughly 600 milliseconds required for the onset of speech.

Distinct steps

The finding shows that Broca's area is involved in all three of these language production steps and shows that they happen at distinct points in time, not all at once in parallel, Sahin said.

While the research answers some questions about how the brain generates language, "this is just one piece in the puzzle," Sahin told LiveScience. It will take more study to further detail all the points of language in the brain: when they occur and what parts of the brain they happen in.

But the finding "may be the nail in the coffin" for one persistent, though long-discredited theory that Broca's area processes the speech part of language, while another area of the brain, called the Werneke's area, processes reading and learning words.

"It's not so simple as Broca's speaks and Werneke's listens," Sahin said.

Funding for the study came from the National Institutes of Health, the Mental Illness and Neuroscience Discovery Institute at Harvard, the Weill Medical College of Cornell University and the Harvard Mind/Brain/Behavior Initiative.

Science News

Tai Chi Exercise Reduces Knee Osteoarthritis Pain In The Elderly, Research Shows
ScienceDaily (Nov. 1, 2009) — Researchers from Tufts University School of Medicine have determined that patients over 65 years of age with knee osteoarthritis (OA) who engage in regular Tai Chi exercise improve physical function and experience less pain. Tai Chi (Chuan) is a traditional style of Chinese martial arts that features slow, rhythmic movements to induce mental relaxation and enhance balance, strength, flexibility, and self-efficacy.

Full findings of the study are published in the November issue of *Arthritis Care & Research*, a journal of the American College of Rheumatology.

The elderly population is at most risk for developing knee OA, which results in pain, functional limitations or disabilities and a reduced quality of life. According to the Centers for Disease Control and Prevention (CDC) there are 4.3 million U.S. adults over age 60 diagnosed with knee OA, a common form of arthritis that causes wearing of joint cartilage. A recent CDC report further explains that half of American adults may develop symptoms of OA in at least one knee by age 85.

For this study, Chenchen Wang, M.D., M.Sc., and colleagues recruited 40 patients from the greater Boston area with confirmed knee OA who were in otherwise good health. The mean age of participants was 65 years with a mean body mass index of 30.0 kg/m2. Patients were randomly selected and 20 were asked to participate in 60-minute Yang style Tai Chi sessions twice weekly for 12 weeks. Each session included: a 10-minute self-massage and a review of Tai Chi principles; 30 minutes of Tai Chi movement; 10 minutes of breathing technique; and 10 minutes of relaxation.

"Tai Chi is a mind-body approach that appears to be an applicable treatment for older adults with knee OA," said Dr. Wang. Physical components of Tai Chi are consistent with current exercise recommendations for OA, which include range of motion, flexibility, muscle conditioning, and aerobic work out. Researchers believe the mental feature of Tai Chi addresses negative effects of chronic pain by promoting psychological wellbeing, life satisfaction, and perceptions of health.

The remaining 20 participants assigned to the control group attended two 60-minute class sessions per week for 12 weeks. Each control session included 40 minutes of instruction covering OA as a disease, diet and nutrition, therapies to treat OA, or physical and mental health education. The final 20 minutes consisted of stretching exercises involving the upper body, trunk, and lower body, with each stretch being held for 10-15 seconds.

At the end of the 12-week period, patients practicing Tai Chi exhibited a significant decrease in knee pain compared with those in the control group. Using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pain scale, researchers noted a -118.80 reduction in pain from baseline between the Tai Chi and control group. Researchers also observed improved physical function, self-efficacy, depression, and health status for knee OA in subjects in the Tai Chi group. "Our observations emphasize a need to further evaluate the biologic mechanisms and approaches of Tai Chi to extend its benefits to a broader population," concluded Dr. Wang.

Science NOW UP TO THE MINUTE NEWS FROM SCIENCE

Don't Shush That Baby, It's Learning

by Helen Fields on November 5, 2009 12:00 AM |

A newborn's cry is a call to action. "Quick, somebody help me!" But bawling babies are getting something else besides attention: language practice. A new study finds that, in the first few days of life, babies produce cries that mimic the melodies of their native language.

By the time a baby is born, it's been learning about the outside world for a long time. In the last 3 months of gestation, a fetus's ears have developed enough to pick up sounds, including its mother's voice. This may explain why newborns--babies up to 1 month old--already seem to prefer being talked to in their native tongue. By 4 months or so, babies have a lot of outside-the-womb experience--and a better-developed vocal tract. That's when they start babbling in their parent's language or languages. But researchers didn't believe that babies could make native-language-specific sounds before this age.

Behavioral scientist Kathleen Wermke of the University of Würzburg in Germany suspected otherwise. She's been studying babies' cries for 2 decades and has seen, for example, that children whose cries have more complex melodies and rhythms at 2 months of age have more developed language skills later. "I think cry melody is really the beginning of language development," Wermke says. Her new study backs that up.

Wermke and colleagues analyzed digital recordings of cries from 30 German and 30 French babies who were between 2 and 5 days old. All of the crying was spontaneous; no babies were harmed in the making of this study. The researchers analyzed melody contour--whether the cries tended to rise from lower pitches to higher pitches or to fall from higher pitches to lower pitches.

All of the infants tried out their vocal repertoire with a wide variety of cries, the scientists report online today in *Current Biology*. But French babies produced more cries with a rising contour, whereas German babies produced more falling cries. These melodies are typical of the speech patterns of their respective languages, the team reports.

The findings indicate that newborn infants are already making sounds that are precursors to the sentences they'll be saying in a few years, says Wermke. That makes perfect sense, she says. "Why should a baby wait for 4, 5, 6 months before starting this language development?" Wermke thinks babies learn the melody of the language in utero, although it's impossible to rule out that they're showing the results of very rapid learning since birth.

"My mouth was kind of hanging open as I was reading," says Janet Werker, a developmental psychologist at the University of British Columbia in Canada. Researchers knew that "[newborns] can hear the difference between things, they have a preference for their mother's voice, but to show that it's actually affecting their cry production is pretty stunning." She points out that it's particularly impressive that infants apparently have some control over their vocalizations, an ability some older studies suggested that newborns lacked.

Wermke says the next step is to compare cries from other language backgrounds, like Chinese and Japanese. She would also like to look at hearing-impaired infants to see how their cries differ. She says the study is a reminder that language does not start with the first words, or even the first syllables. Newborn infants may look like tiny blobs who do nothing but sleep, eat, and cry, but they're already warming up for a lifetime of talking.

News in Science

New species of dinosaur discovered

Thursday, 12 November 2009 Andrew Geoghegan for AM
ABC

Artist's impression of a sauropod, which scientists believe Aardonyx evolved into*(Source: Laurie Beirne)*

An Australian palaeontologist has unearthed the fossilised remains of a new species of dinosaur, which has prompted a re-think about dinosaur evolution.

The discovery was made in South Africa and scientists think it may help explain how dinosaurs evolved from two-legged animals into the four-legged sauropods - the largest creatures to walk the earth.

Scientists believe the nine-metre long *Aardonyx*, which roamed the earth about 195 million years ago at the dawn of the Jurassic period, died by a river in what is now the Free State in central South Africa.

Palaeontologist Dr Adam Yates of the a University of Witwatersrand says scientists had no idea the plant-eating dinosaur existed until he and his team began digging 5 years ago and unearthed the animal's fossilised remains.

"It was a pretty large dinosaur for its time," he says. "We have only found juvenile bones, but the largest individual at this site was probably in the vicinity of nine metres in length and two metres high at the hips."

Yates says *Aardonyx* would have been a fairly slow moving, heavy bodied animal.

"[It was] a big barrel-bellied animal with quite thick, solid, heavy hind legs and a rather short broad foot. We have a hand that had some sort of crude grasping ability, large claws on the end of the hands, and then a long, thin neck and quite a small head."

Early sauropod

Aardonyx is thought to have evolved into the giant sauropods; 40-metre long dinosaurs that weighed more than 100 tonnes.

Yates says the find is significant because *Aardonyx* is a transitional dinosaur, one that is caught between two basic body plans.

"We have the very derived and specialised gigantic sauropods. These are the classic long-necked, small headed giant elephant limbed, four-footed plant eaters, things like the brontosaurus."

He says before the sauropods a group called the prosauropods roamed the planet.

They were bipedal instead of quadripedal, and much smaller than the sauropods, says Yates.

"*Aardonyx* is an animal that sits right in the middle of the transition between the two different types of dinosaur," he says. "It's like the animal that is on the very cusp of dropping down onto all fours and becoming a committed quadruped."

New insight

Yates says the find has changed our understanding of the nature of the evolution of the giant sauropods.

"It really is showing that certain features that we thought only evolved much later after they became committed quadripedal giants were actually present way back in this early stage, that is a new discovery."

The fossils will be put on display at the Transvaal Museum in the South African capital Pretoria.

Enzyme blocker may reverse nerve damage

Tuesday, 27 October 2009 Branwen Morgan
ABC

Blocking the action of a single enzyme prevents injured nerve cells dying and enables them to regrow, say scientists in the US.

Their findings, to be published this week in the early edition of the *Proceedings of the National Academy of Science*, could have implications for sufferers of spinal injury and stroke, as well as neurodegenerative diseases such as Alzheimer's disease.

The enzyme, called HDAC (histone deacetylase) belongs to a group known for their role in controlling gene expression - the creation of proteins based on DNA. Non-specific blocking of these enzymes causes most cells to die, but some nerve cells can survive.

"We decided to try and find which of the HDACs could be selectively blocked to confer the neuroprotective effect without the unwanted toxicity", says Assistant Professor Brett Langley of the Weill Cornell Medical College in New York.

Process of elimination

The researchers used rat nerve cells grown in culture and tested several non-specific HDAC inhibitors to assess their neuroprotective ability during oxidative stress. Oxidative stress occurs in injured nerve tissue and is due to inflammation or loss of blood flow to the region. It can result in the loss of nerve cells for up to several weeks after the initial trauma.

The inhibitors worked despite the presence of substances produced by the injured nerve tissue known to prevent the nerve cells repairing by themselves.

During their experiments they made another interesting finding.

"We were extremely surprised to find that inhibiting a subset of HDACs not only promotes survival of cultured nerve cells but causes them to regenerate," says Langley.

They eventually narrowed the list of HDACs to one key suspect: HDAC6, and designed drugs that would only block this enzyme.

"What's also nice about this discovery is that we believe the enzyme blockers act directly at the trauma site, which is important because nerves can be extremely long and the trauma can disrupt signaling," says Langley.

Protect and repair

Professor Geoffrey Donnan, Director of the Florey Neuroscience Institutes, says these findings are worthy of attention.

"The main advantage is the dual benefit obtained by blocking HDAC6," says Donnan. "The results also suggest that therapeutic benefits may be seen even if the enzyme blockers are applied well after the initial onset of symptoms. This would make it a viable treatment option for a range of neurodegenerative disorders as well as for stroke and spinal injury."

But Donnan notes that many promising strategies have failed to move from the laboratory to the clinic.

Langley agrees.

"We are now testing how well the HDAC6 inhibitors work in vivo. At the same time we aim to uncover all the enzyme's targets so we can better understand the mechanisms that lead to its ability to protect neurons and promote their regrowth," he says.

The world looks different if you're depressed

DEPRESSION really does change the way you see the world. People with the condition find it easy to interpret large images or scenes, but struggle to "spot the difference" in fine detail. The finding hints at visual training as a possible treatment.

Depressed people have a shortage of a neurotransmitter called GABA; this has also been linked to a visual skill called spatial suppression, which helps us suppress details surrounding the object our eyes are focused on - enabling us to pick out a snake in fallen leaves, for instance.

Now Julie Golomb and colleagues at Yale University are trying to link this ability with major depressive disorder (MDD). Golomb asked 32 people to watch a brief computer animation of white bars drifting over a grey and black background, and say which way they were moving. A quicker response gave a higher score. Half of the group had good mental health, while the rest had recently recovered from depression. The latter were chosen so that medication would not interfere with the results, but Golomb thinks results from people with MDD would be similar because the condition is thought to have genetic factors.

When the image was large, the recovered volunteers found the task easier, which means they would do better in the forest scenario. But they performed less well than the other group when looking at a small image. "Their ability to discriminate fine details was impaired, which is the sort of perception that we tend to use on a daily basis," says Golomb (*Journal of Neuroscience*, DOI: 10.1523/jneurosci.1003-09.2009).

"Depression is often thought of as just a mood disorder," she says, "but it can impact upon eating and sleeping habits, and now we know it can even affect the way a person sees the world."

Depression is not just a mood disorder: now we know it can affect the way a person sees the world

In a commentary on the study, Pascal Wallisch and Romesh Kumbhani of New York University propose that perception training could offer a therapy for people with MDD. Golomb says this could be possible, but it's unclear if training would increase levels of GABA.

Early birds may have dropped teeth to get airborne

Holotype of Zhongjianornis yangi gen. et sp. nov. (Image: Zhonghe Zhou and Fucheng Zhang Zhiheng Li)

Fad dieting wasn't an option in the Cretaceous, so the earliest birds went to more extreme measures to address weight issues: they lost their teeth.

Archaeopteryx, at 150 million years old still the oldest known bird, had an imposing set of teeth. But within 20 million years, at least some birds were toothless. Now a team led by Zhonghe Zhou at the Chinese Academy of Sciences in Beijing believe they know why.

They discovered *Zhongjianornis yangi*, a toothless bird from 122 million years ago in China's Liaoning province. Their analysis shows that *Z. yangi* belonged to one of four bird groups that independently lost their teeth, implying that this loss was no evolutionary fluke. *Z. yangi*'s group is the most primitive among them, suggesting it could provide clues as to why tooth loss occurred.

The team compared the body structure of a number of early birds and found that some toothed species were more adapted for flight. They think natural selection may have put pressure on weaker fliers to lose their teeth in a bid to improve their skills by losing excess weight. "It would be especially advantageous to reduce the weight of the head because [it] is further from the centre of gravity," they write.

That theory is "as good as any other", says Mike Benton at the University of Bristol, UK, though he remains sceptical. "Losing teeth wouldn't make a huge difference to balance in the air."

Journal reference: *Proceedings of the Royal Society B*, DOI: 10.1098/rspb.2009.0885

number 17

A Battery Made With Paper

by Robert F. Service on December 8, 2009 12:00 AM

Paper has been getting beat by electronics for years. But it may be about to stage a comeback. Researchers are reporting that they've made batteries and other energy-storage devices by printing layers of carbon nanotube–based ink atop standard photocopy paper. The result is a highly conductive sheet that can carry a charge and be easily incorporated into a flexible battery. Because of paper's low cost, that could help lower the price of batteries used in electric vehicles, wind farms, and other renewable sources.

The idea of using paper to make a lightweight, flexible battery isn't new. Researchers led by Robert Linhardt, a chemist at Rensselaer Polytechnic Institute in Troy, New York, first explored the concept 2 years ago. They cast a thin film of cellulose--the same starting material used to make paper--and laid it over conductive carbon nanotubes. The hope was that the cellulose would serve as a sturdy structural material to hold the other components for making a battery, and it did. But the two layers remained independent and could split apart if flexed.

Yi Cui, a materials scientist at Stanford University in Palo Alto, California, had also been exploring using plastics and other types of thin layers as the structural supports for batteries and supercapacitors (which store energy as static charge, unlike batteries that undergo chemical reactions). But the plastic layers also didn't connect well with the conductive nanotubes placed on top. Conventional copy paper has a highly porous structure. So Cui and his colleagues wondered if that could serve as a good support for their nanotubes.

The researchers created an "ink" of carbon nanotubes suspended in water and an organic surfactant. They then heated the paper in an oven to drive off the water. The nanotubes bonded tightly to the paper fibers, creating a highly conductive sheet of paper that functions even when rolled up. The team then used these conductive sheets as components in both lithium-ion batteries and supercapacitors.

The paper batteries can store up to 7.5 Watt-hours per kilogram (Wh/kg), the team reported online this week in the *Proceedings of the National Academy of Sciences*. That's not quite up to the level of lead acid batteries, which store roughly 30 Wh/kg. But because the cost of nanotubes is coming down, and because paper is cheap and durable, it could open the door to cheaper batteries for large-scale energy storage.

"It's quite innovative and an important contribution," says Linhardt. The fact that the nanotubes and paper fibers hold tight is critical, he adds, because it now enables engineers to make batteries in almost any shape. Paper's strength could also help battery makers reduce the thickness of the electrodes they use to make batteries, which in many cases are made thick to provide structural support for the batteries. And that reduced amount of electrode material could further reduce the battery's cost.

LIVE SCIENCE

Surprise! Your Skin Can Hear
Wednesday, November 25, 2009
By Jeanna Bryner

We not only hear with our ears, but also through our skin, according to a new study.

The finding, based on experiments in which participants listened to certain syllables while puffs of air hit their skin, suggests our brains take in and integrate information from various senses to build a picture of our surroundings.

Along with other recent work, the research flips the traditional view of how we perceive the world on its head.

"[That's] very different from the more traditional ideas, based on the fact that we have eyes so we think of ourselves as seeing visible information, and we have ears so we think of ourselves as hearing auditory information. That's a little bit misleading," study researcher Bryan Gick of the University of British Columbia, Vancouver, told LiveScience.

"A more likely explanation is that we have brains that perceive rather than we have eyes that see and ears that hear."

With such abilities, Gick views humans as "whole-body perceiving machines."

The research, funded by the Natural Sciences and Engineering Council of Canada and the National Institutes of Health, is detailed in the Nov. 26 issue of the journal Nature.

How We Perceive

Gick's work builds on past studies showing, for instance, that we can see sound and hear light, even if we don't consciously realize it. Other studies show if you observe another person's lips moving and think that other is speaking, your brain's auditory regions would light up, Gick said.

Scientists had explained such sensing prowess as the result of experience, as we see and hear people speaking all the time and so it'd be only natural to learn how to integrate what we see with what we hear.

The alternative would be an innate ability. And so Gick and his colleague Donald Derrick, also of the University of British Columbia, studied two senses that aren't generally paired — auditory and tactile — to figure out the root of perception.

How Skin Hears

The team focused on aspirated sounds, such as "pa" and "ta" that involve an inaudible burst of air when spoken, as well as unaspirated sounds, such as "ba" and "da."

Blind-folded participants listened to recordings of a male voice saying each of the four syllables and had to press a button to indicate which sound they heard (pa, ta, ba or da). Participants were divided into three groups of 22, with one group hearing the syllables while a puff of air was blown onto their hand, the other had air blown onto the neck, and the control group heard the sounds with no air.

About 10 percent of the time when air was puffed onto the skin, participants mistakenly perceived the unaspirated syllables as being their aspirated equivalents. So when the guy said "ba," such participants would indicate they heard "pa." The control group didn't show such mistaken perceptions.

A follow-up experiment in which participants got a tap on the skin rather than a puff of air showed no such mix-up between aspirated and unaspirated sounds.

Next, Gick is working with scientists from the University of California, San Francisco, to figure out how the brain allows such multi-sense integration.

number 19

Newborn cells clear space in brain's memory-maker
Neurogenesis helps break old circuits in the hippocampus
By Tina Hesman Saey
December 5th, 2009; Vol.176 #12 (p. 10)

Old memories may get the boot from new brain cells.
A new rodent study shows that newborn neurons destabilize established connections among existing brain cells in the hippocampus, a part of the brain involved in learning and memory. Clearing old memories from the hippocampus makes way for new learning, researchers from Japan suggest in the Nov. 13 *Cell*.

Other researchers had proposed the idea that neurogenesis, the birth of new neurons, could disrupt existing memories, but the *Cell* paper is the first to show evidence supporting the idea, says Paul Frankland, a neuroscientist at the Hospital for Sick Children in Toronto.

Scientists have known that memories first form in the hippocampus and are later transferred to long-term storage in other parts of the brain. For some amount of time the memory resides both in the hippocampus and elsewhere in the brain. What's not been known is how, after a few months or years, the memory is gradually cleared from the hippocampus.

Researchers have also debated the role of neurogenesis in learning and memory. The hippocampus is one of only two places in the adult brain where scientists know that new neurons form. On the basis of previous studies, many researchers think new neurons stabilize memory circuits or are somehow otherwise necessary to form new memories.

The new study suggests the opposite: Newborn neurons weaken or disrupt connections that encode old memories in the hippocampus.

Kaoru Inokuchi, a neuroscientist at the University of Toyama in Japan, and his colleagues used radiation and some genetic tricks to block neurogenesis in rats and mice that had been trained to fear getting a mild electric shock when placed in a particular cage. Control animals, with normal neurogenesis, eventually were able to bypass their hippocampi and retrieve the fear memory directly from long-term storage. But animals in which neurogenesis had been blocked still depended on the hippocampus to recall the fear memory, the researchers found.
Running on an exercise wheel, which boosts neurogenesis, also sped the rate at which old memories were cleared from the hippocampus.

But that doesn't mean new neurons aren't necessary to teach old brains new tricks, says Inokuchi.

"Our findings do not necessarily deny the important role of neurogenesis in memory acquisition," Inokuchi says. "Hippocampal neurogenesis could have both of these roles, in erasing old memories and acquiring new memories."
Essentially, the new neurons may aid formation of new memories by keeping the hippocampus from filling up with old ones.

Frankland adds, "This is about as novel as it gets in the field of neurogenesis and memory. It pretty much represents an entirely new framework that other researchers will chip away at for years to come."

Science NOW UP TO THE MINUTE NEWS FROM SCIENCE

Scottish as a Second Language

by Helen Fields on November 11, 2009 12:00 AM

Say what? Watching *Trainspotting* with English subtitles helps train your ear to pick up Scottish accents.
Credit: Photos12/Alamy

It's a common problem for people learning a foreign language. You've mastered one dialect--say, the Norwegian spoken in Oslo or the Spanish spoken in Mexico--and then you go to Trondheim or Madrid and think, "What in the heck are these people speaking?" A new study offers a tip for learning to recognize unfamiliar dialects: Watch a foreign film with foreign subtitles.

Humans constantly need to work out unfamiliar sounds. We talk to new people, hear new accents, and listen to familiar people with stuffy noses. Previous experiments have found that we use what we already know about a language to decode new things we hear. For example, if someone hears a strange consonant that's somewhere between an "s" and an "f" in the word "horf," they hear "horse." In "girass," people usually hear "giraffe." Which of these words they've heard then dictates whether they'll hear the sound in "nife" as "nice" or "knife."

Psychologist Holger Mitterer of the Max Planck Institute for Psycholinguistics in Nijmegen, the Netherlands, wanted to see whether this "lexically guided learning" would work in real-life situations in which the listener has to understand an accent. Mitterer, who is German, chose to design the study around movies partly because of his own experience as an English learner. "When I first got to the Netherlands, a couple of exchange students went to see Trainspotting"--a Scottish film about heroin addicts--"and all the others had trouble following the movie," says Mitterer. But he understood enough Dutch to get a little help from the Dutch subtitles. "By the end of the movie, I was quite comfortable in following Ewan McGregor," the star of the film.

For the study, Dutch students who were fluent in English watched either a 25-minute episode of the Australian sitcom *Kath & Kim*, whose characters speak in broad accents from the Melbourne suburbs, or a version of *Trainspotting*, which was edited down to the same length by taking out the offensive parts. "I felt a bit like a film editor from the '50s," says Mitterer. "Two people are getting in the cab, they start kissing, then I cut and it's breakfast." Some students saw video with English subtitles and some with Dutch subtitles. Then the students heard sound clips of words--some they'd heard already and some new words spoken by the same characters.

As the researchers report today in *PLoS ONE*, English and Dutch subtitles helped the students understand words that they'd already heard, but only English subtitles helped them understand new words in the same accent. "Let's take Australian English," says Mitterer. 'Straight away' is something like 'strite awye.' If you get that, you'll get 'kiveman,' which is supposed to mean 'caveman.' " But only if you saw the words "straight away" in English on the screen; the Dutch translation doesn't help.

This makes sense, says linguist Ann Bradlow of Northwestern University in Evanston, Illinois. "When you read the Dutch words, you're bringing to the front of your mind the [Dutch] sound, even though you're not hearing the sounds, and that interferes with your ability to access the sound of English words." She recommends that the millions of non-native speakers of English in the United States put the results into action by turning on the closed-captioning for the hearing impaired on their televisions.

The rest of us need a lobbying campaign to get distributors to include foreign-language subtitles on the DVDs of foreign movies, says psycholinguist Cathi Best of the University of Western Sydney in Australia. "I like the study; it's clever," she says. "It's a good foot in the door to how second-language speakers can become more flexible in the way that they recognize words."

Study finds who is afraid of the bogeyman

Friday, 13 November 2009 Nicky Phillips
ABC

The children felt that dads aren't scared of such creatures because they were 'brave'

A new study suggests the way children cope with imaginary monsters differs with age and gender.

The research, published in today's edition of *Child Development*, also offers parents some strategies on how to help their children cope with real and imagined fears.

Psychologist and study author Dr Liat Sayfan of the University of California, Davis says to understand the coping strategies of children, she and colleagues asked 48 children, aged between four and seven, to listen to a series of short stories.

Each story featured a child who came in contact with a real scary creature, such as a bear, or an imaginary creature like a witch, which children could perceive as frightening, says Sayfan.

Sayfan says she chose to make the characters in the stories experience the fear, rather than scaring the children themselves.

"I didn't think parents would want me to scare their children."

She says when the children listened to stories that included real scary creatures, they suggested that the character avoid the creature.

But she says there were some differences in the coping mechanisms between the sexes.

"I found boys often suggested attacking or killing [the creature], where as girls would suggest running away and finding their parents."

Imaginary creatures

Sayfan says, when the stories dealt with imaginary creatures there wasn't a difference in the suggestions between the sexes, but between the ages of the children.

Preschool children wanted to turn the situation into a positive one, "they'd say things like 'let's imagine the witch is really nice'," she says.

Four year olds understand what's real and not real, but when it comes to coping with their fears sayfan says it's very difficult for them to use this knowledge to feel better.

On the other hand, six and seven year olds were able to cope by reminding themselves that the creature wasn't real, she says.

"Seven year olds use this knowledge of what's real and what's not to feel better."

Sayfan says when young children say they're scared of a monster after a bad dream, parents don't need to convince their child that the creature doesn't exist.

"These [children are] really absorbed in their imagination and it's really hard for them to let this go and think about reality."

She says a better strategy is to keep their imagination going "by saying this monster is really nice," and then explain in the morning that monsters aren't real.

Adult fears

As part of the study, Sayfan also asked the children to predict if other people, such as adults, would experience the same fears children have of real and imaginary creatures.

She says the children felt that dads wouldn't be scared of such creatures because they were "brave".

They believed mothers might be a little scarred, says Sayfan, but not to the extent children would be.

"[Children] know really well that it's their own fear and that adults know better and aren't afraid of those sort of things."

Sayfan says the idea for her study came from watching her own child's fears.

"I watched how he tried to cope with his fear and my curiosity got going about what works and what doesn't."

Sayfan plans to conduct further studies in the area and assess whether children actually use the strategies they suggest as coping mechanisms.

number 22

20 November 2009

Popular cigarette brands loaded with bacteria

by Kate Melville

Cigarettes are "widely contaminated" with bacteria known to be harmful to humans, claims a new study in *Environmental Health Perspectives*. And, according to the researchers, some of the organisms identified are resilient enough to survive the burning process.

The study, conducted by a University of Maryland (UM) environmental health researcher and microbial ecologists at the Ecole Centrale de Lyon in France, is the first to show that cigarettes themselves could be the source of exposure to a wide array of potentially pathogenic microbes among smokers and other people exposed to secondhand smoke.

"We were quite surprised to identify such a wide variety of human bacterial pathogens in these products," says UM's Amy R. Sapkota, the lead researcher on the study. "The commercially-available cigarettes that we tested were chock full of bacteria, as we had hypothesized, but we didn't think we'd find so many that are infectious in humans."

But can the cigarette-borne bacteria survive the burning process and go on to colonize smokers' respiratory systems? According to Sapkota, existing research suggests that some hardy bacteria can be transmitted this way, which would account for the fact that the respiratory tracts of smokers are characterized by higher levels of bacterial pathogens.

"[The bacteria could] contribute to both infectious and chronic illnesses in both smokers and individuals who are exposed to environmental tobacco smoke," Sapkota warns. "So, it's critical that we learn more about the bacterial content of cigarettes, which are used by more than a billion people worldwide."

Previous studies have taken small samples of cigarette tobacco and placed them in cultures to see whether bacteria would grow. But Sapkota's team took a more holistic approach using DNA microarray analysis to estimate the so-called bacterial metagenome, the totality of bacterial genetic material present in the tested cigarettes.

Key findings from the analysis:

- Commercially available cigarettes show a broad array of bacterial diversity, ranging from soil microorganisms to potential human pathogens.
- Hundreds of bacterial species were present in each cigarette, and additional testing is likely to increase that number significantly.
- Bacteria identified included:
    - *Acinetobacter*
      (associated with lung and blood infections)
    - *Bacillus*
      (some varieties associated with food borne illnesses and anthrax)
    - *Burkholderia*
      (some forms responsible for respiratory infections)
    - *Clostridium*
      (associated with foodborne illnesses and lung infections)
    - *Klebsiella*
      (associated with a variety of lung, blood and other infections)
    - *Pseudomonas aeruginosa*
      (an organism that causes 10 percent of all hospital-acquired infections in the United States)
- No significant variability in bacterial diversity was observed across the four different cigarette brands examined: Camel; Kool Filter Kings; Lucky Strike Original Red; and Marlboro Red.

"Now that we've shown that a pack of cigarettes is loaded with bacteria, we will conduct follow-up research to determine the possible roles of these organisms in tobacco-related diseases," Sapkota said in conclusion.

ScienceDaily
Your source for the latest research news

Early Relationships Influence Teen Pain and Depression

ScienceDaily (Nov. 25, 2009) — Angst could be more than a rite of passage for insecure teenagers, according to a study published in the *Journal of Pain*. Researchers from the Université de Montréal, Sainte-Justine University Hospital Center and McGill University have discovered that insecure adolescents experience more intense pain in the form of frequent headaches, abdominal pain and joint pain. These teens are also more likely to be depressed than peers with secure attachments.

Dr. Isabelle Tremblay, a researcher at the Université de Montréal and its affiliated Sainte-Justine University Hospital Center, and Dr. Michael Sullivan, a psychology professor at McGill University, launched this study to build on previous findings that childhood experiences play a major role in the relationships people develop in later life. Simply put: insecure infants grow up to be insecure adolescents, and later, insecure adults.

"Although previous studies in adults found that an individual's security level was influenced by painful experiences, it was not clear why relationship security should be related to pain," says Dr. Tremblay. "We found that adolescents with insecure relationships tend to be more 'alarmist' about their pain symptoms; they have a tendency to amplify the degree of threat or severity of their pain. This amplification leads to more intense pain and more severe depressive symptoms." Some 382 students, from Grades 8 through 12, were recruited for the study from a francophone high school in Montreal, Canada. Participants were asked to fill questionnaires on the frequency and intensity of their emotional and physical pain.

"It is possible that individuals who have insecure relationships may perceive the world as more threatening or more stressful and that manifests in physical symptoms," says Dr. Sullivan. "Alternately, it is possible that individuals who feel insecure might 'express' more intense distress as a means of eliciting support from others in their social environment."

Interpersonal factors must be considered when managing adolescent experiences of pain and depression, according to the researchers. "Adolescents have different health and mental health needs than adults. Although interpersonal factors have not been considered integral component of the treatment of pain and depression in adults, these factors might need to be considered in the treatment of adolescents," stresses Dr. Sullivan.

ScienceDaily
Your source for the latest research news

Parent Training Key to Improved Treatment of Behavior Problems in Children With Autism

ScienceDaily (Nov. 26, 2009) — The serious behavior problems that can occur in children with autism and related conditions can be reduced with a treatment plan that includes medication combined with a structured training program for parents, according to Yale University researchers and their colleagues.

Published in the December 2009 issue of the *Journal of the American Academy of Child and Adolescent Psychiatry*, the study was conducted by the National Institute of Mental Health (NIMH) Research Units on Pediatric Psychopharmacology (RUPP) Autism Network. The 24-week, three-site trial was conducted at Yale, Ohio State University and Indiana University. Lawrence Scahill, professor at Yale School of Nursing and the Yale Child Study Center, is principal investigator at the Yale site.

Results from a 2002 RUPP report showed that the antipsychotic medication risperidone (Risperdal) reduced such behavioral problems as tantrums, aggression and self-injury in children with autism. However, most children's symptoms returned when the medication was discontinued after six months of effective treatment. Also, risperidone is associated with adverse effects such as weight gain, which can lead to obesity and related health problems.

In this new study, the RUPP group tested the benefits of medication alone compared to medication plus a parent training program that actively involves parents in managing their children's severely disruptive and noncompliant behaviors. In a series of 14 sessions over six months, parents were taught to reduce their children's challenging behavior and to enhance daily living skills.

The study included 124 children ages 4 to 13 with pervasive developmental disorders (PDD) such as autism, Asperger's or related disorders accompanied by tantrums, aggression and self-injury. The children were randomly given a combination of risperidone and parent training, or risperidone only.

Although both groups improved over the six-month trial, the group receiving combination therapy showed greater reduction in disruptive behavior, tantrums and aggression compared to the group receiving medication only. The combination therapy group also ended the trial taking an average dose of 1.98 milligrams (mg) per day of risperidone, compared to 2.26 mg per day in the medication-only group -- a 14 percent lower dose. However, children in both groups gained weight, indicating "a need to learn more about the metabolic consequences of medications like risperidone," noted Scahill.

"The results show that the parent training intervention can be delivered in a reliable manner and results were the same across all sites," said Scahill. "This is important because it shows that the intervention is exportable -- and ready for dissemination."

The RUPP group is expecting to launch a multi-site parent training study in preschool-age children with pervasive developmental disorders. "We hope to show that these behavioral problems can be reduced in children without medication -- if intervention starts early," Scahill said. "Future studies may also look for ways in which the parent training program can be used in schools and community clinics."

ScienceDaily
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New Cause for Alzheimer's Disease?

ScienceDaily (Nov. 27, 2009) — Dr. Carme Espinet and colleagues at the University of Lleida, Lleida, Spain have discovered that a precursor to nerve growth factor (pro-NGF) may play a pathogenic role in Alzheimer's disease. They present these findings in the December 2009 issue of *The American Journal of Pathology*.

Alzheimer's disease is a degenerative, terminal form of dementia that affects over 35 million people world-wide. Oxidative stress, which occurs in the early stages of Alzheimer's disease, may modify molecules, resulting in loss or alteration of their function.

A precursor to nerve growth factor (pro-NGF) is expressed at high levels in Alzheimer's disease-affected individuals, and accumulation of pro-NGF may lead to neural cell death. Kichev et al showed that pro-NGF is modified in an Alzheimer's disease stage-dependent manner by oxidative stress and that modified pro-NGF blocked processing to mature NGF and led to neuronal cell death. Furthermore, injection of modified pro-NGF or pro-NGF derived from human Alzheimer's disease patients into mice resulted in cognitive and learning impairment, suggesting that modified pro-NGF may provide a novel pathogenic pathway for Alzheimer's disease.

Dr. Espinet's group suggests "that intra-cerebroventricular administration of AGE/ALEs modified pro-NGF to mice impairs learning tasks, thus reinforcing the idea that pro-NGF could have a relevant role in the ethiopathogenesis of the disease."

ScienceDaily
Your source for the latest research news

Examining Mathematical Abilities in Children With Fetal Alcohol Spectrum Disorder

ScienceDaily (Nov. 20, 2009) — Children with fetal alcohol spectrum disorder (FASD) have a number of cognitive deficits, but mathematical ability seems particularly damaged. Little is known about the brain structures related to mathematical deficits in children with FASD. A new study that used diffusion tensor imaging (DTI) to investigate the relationship between mathematical skills and brain white matter structure in children with FASD supports the importance of the left parietal area for mathematical tasks.

Results will be published in the February 2010 issue of *Alcoholism: Clinical & Experimental Research*. "Children with FASD have learning difficulties with reading, memory, executive functioning, attention, and mathematics," said Christian Beaulieu, associate professor in the department of biomedical engineering at the University of Alberta and senior author for the study.

"Specific deficits in mathematics exist even when their global deficits are taken into account," added Claire D. Coles, professor of psychiatry and behavioral sciences at the Emory University School of Medicine. "Children with FASD are similar in their presentation to children with nonverbal learning disabilities, which are sometimes associated with visual/spatial deficits and math deficits; one of the factors thought to produce these effects is deficits in white matter integrity."

"From studies of brain function, we know that the parietal brain regions are involved in mathematics and number tasks," said Catherine Lebel, a Ph.D. student in biomedical engineering who is also corresponding author for the study. "We knew that mathematics was a key deficit in FASD and decided to examine which brain structures were related to these mathematical deficits."

The researchers used DTI to scan 21 children (12 boys, 9 girls), five to 13 years of age, who had been diagnosed with FASD in an earlier study; they also used a cognitive assessment to establish the children's mathematical abilities.

"We found that four different brain areas show correlations between structure and mathematical ability in children with FASD," said Lebel. "Two of these regions in the left parietal area are very similar to previous findings in healthy children and in a rare genetic disorder, suggesting that these regions are key areas for math across diverse populations. The two other regions -- the cerebellum and the brainstem -- might be unique to children with FASD in terms of math-structure relationships."

"The parietal lobes are what is referred to as the 'association' cortex because it is clear that it is in these areas that a great deal of the higher level 'thinking' occurs, in which different aspects of sensory processing -- such as visual and auditory information -- as well as cognitive activities are 'associated,'" said Coles. "Math processing relies on a number of skills, visual/spatial skills, executive functioning (which rely on the frontal lobes), and probably the corpus callosum which allows integration of information in the two hemispheres. Previous research has also shown that 'math' processing is associated with certain parts of the parietal lobes. However, different areas seem to be related to different processes, like addition and subtraction, and more difficult kinds of math involve more areas, which are interrelated in 'networks.'

"Our findings demonstrate a link between brain structure and cognition that provides insight into how the FASD brain works," said Lebel, "and also help understand mathematical processing in a larger population because of the similarities to previous studies. Ultimately, a better understanding of the underlying cause of the various cognitive deficits in FASD may lead to better treatment and improved quality of life."

ScienceDaily
Your source for the latest research news

New Tool for Helping Pediatric Heart Surgery

ScienceDaily (Nov. 27, 2009) — A team of researchers at the University of California, San Diego and Stanford University has developed a way to simulate blood flow on the computer to optimize surgical designs. It is the basis of a new tool that may help surgeons plan for a life-saving operation called the "Fontan" surgery, which is performed on babies born with severe congenital heart defects.

The researchers will present their work next week at the 62nd Annual Meeting of the American Physical Society's (APS) Division of Fluid Dynamics will take place from November 22-24 at the Minneapolis Convention Center.

Babies who get this surgery have a developmental disease where one of the chambers -- or ventricles -- of the heart fails to grow properly. This leaves their hearts unable to properly circulate blood through their lungs and starves their bodies of oxygen. The lack of oxygen turns their skin blue, a condition sometimes referred to as "blue baby syndrome" for that reason.

The Fontan surgery is one of three surgeries performed immediately after birth to replumb the circulation of children born missing their left ventricles. The operation essentially connects the veins that would normally bring blood into the right side of the heart with the pulmonary arteries. The aim is to redirect the blood flow so that it becomes properly oxygenated, allowing the patient to survive with only one functional pumping chamber. Before the advent of this type of surgery in the early 1970's, these sorts of heart conditions were uniformly fatal.

There are still risks, including exercise intolerance, blood clot formation, and eventual heart failure requiring transplantation. Doctors mitigate this risk by carefully planning the surgery, starting with images of a baby's heart and then sketching out their plans. UCSD's Alison Marsden has been working with surgeons at Rady Children's Hospital and Stanford University to develop a new computational tool to assist in this process. In addition, Dr. Marsden and cardiologist Jeff Feinstein have developed a new Y-graft design for the Fontan surgery that is expected to be put into clinical use within a few months.

"Our ultimate goal is to optimize surgeries that are tailored for individual patients so that we don't have to rely on a "one-size fits all" solution," says Marsden.

The tool first uses imaging data to construct a model of an individual baby's heart and then allows doctors to input their surgical designs. The computer can then systematically explore different potential designs using powerful optimization algorithms, similar to those used in the aerospace industry for aircraft design. It then applies fluid dynamics to simulate the blood flow after reconstruction. This way, says Marsden, surgeons can test their plans and evaluate blood flow patterns before operating.

The New York Times

November 24, 2009
Observatory
By Happy Accident, Chemists Produce a New Blue
By KENNETH CHANG

Blue is sometimes not an easy color to make.

Blue pigments of the past have often been expensive (ultramarine blue was made from the gemstone lapis lazuli, ground up), poisonous (cobalt blue is a possible carcinogen and Prussian blue, another well-known pigment, can leach cyanide) or apt to fade (many of the organic ones fall apart when exposed to acid or heat).

So it was a pleasant surprise to chemists at Oregon State University when they created a new, durable and brilliantly blue pigment by accident.

The researchers were trying to make compounds with novel electronic properties, mixing manganese oxide, which is black, with other chemicals and heating them to high temperatures.

Then Mas Subramanian, a professor of material sciences, noticed that one of the samples that a graduate student had just taken out of the furnace was blue.

“I was shocked, actually,” Dr. Subramanian said.

In the intense heat, almost 2,000 degrees Fahrenheit, the ingredients formed a crystal structure in which the manganese ions absorbed red and green wavelengths of light and reflected only blue.

When cooled, the manganese-containing oxide remained in this alternate structure. The other ingredients — white yttrium oxide and pale yellow indium oxide — are also required to stabilize the blue crystal. When one was left out, no blue color appeared.

The pigments have proven safe and durable, Dr. Subramanian said, although not cheap because of the cost of the indium. The researchers are trying to replace the indium oxide with cheaper oxides like aluminum oxide, which possesses similar properties.

The findings appear in the Journal of the American Chemical Society.

number 29

Chocolate Reduces Stress, Study Finds
By Clara Moskowitz, LiveScience Staff Writer
posted: 11 November 2009 02:13 pm ET

Go ahead, grab a chocolate bar. New evidence is in that eating dark chocolate every day can reduce stress.

The study, announced today, found that people who rated themselves highly stressed to begin with had lower levels of stress hormones after eating chocolate every day for two weeks. The study's subjects ate 1.4 ounces (40 g) of dark chocolate daily, or a little less than a regular-sized Hershey's bar, which contains 1.55 ounces (44 g).

The doctors took urine and blood plasma samples from the participants at the beginning, halfway through, and at the end of the two week study, and found lower levels of the stress hormones cortisol and catecholamines in the samples at the end.
The study was small, however — just 30 people — so further research is needed to verify the results.

The scientists, led by Sunil Kochhar of the Nestle Research Center in Switzerland, detailed their findings in the Oct. 7 issue of the Journal of Proteome Research.

"The daily consumption of dark chocolate resulted in a significant modification of the metabolism of healthy and free living human volunteers with potential long-term consequences on human health within only 2 weeks treatment," the researchers wrote in the paper. "This was observable through the reduction of levels of stress-associated hormones and normalization of the systemic stress metabolic signatures."

The study adds to a growing body of research showing that certain elements in chocolate — such as antioxidants called polyphenols — can have helpful health benefits. Previous studies found chocolate can help fight heart disease and reduce the chances of developing cancer.
Of course, moderation is key. Since most chocolate products contain fat and sugar, it's possible to have too much of a good thing.

News in Science

Lithium provides clue to planet presence

Friday, 13 November 2009 Stuart Gary
ABC

The presence of a proto-planetary disc might slow down the star's rotation resulting in a drop in its lithium content *(Source: ESO/L Calcada)*

Scientists in Spain believe they've found a link between the amount of lithium in Sun-like stars, and whether they have planets orbiting them.

Reporting in the science journal *Nature*, the team led by Dr Garik Israelian of the Instituto de Astrofisica in the Canary Islands have concluded that Sun-like stars with planets have significantly less lithium in their spectra than similar stars without planets.

The researchers believe it may also help solve a longstanding puzzle about the Sun's lithium levels, which has 140 times less lithium than the primordial value - the amount produced in the big bang.

Why the Sun has so little lithium is a question astronomers have been unable to answer.

The Sun's surface isn't hot enough to burn lithium. And its convective zone does not extend deep enough into the interior to reach the sort of temperatures and pressures needed for lithium to fuse.

Planetary link

Israelian and colleagues looked at a sample of stars similar in age, mass and chemical make up to the Sun.

They found those with planets, all have less than 1% of the primordial lithium abundance.
Those without detected planets range more widely, with half having about 10% of the primordial lithium abundance.

Israelian and colleagues believe the key to the difference could be the interaction between the star and its orbiting planets early in the system's evolution.

They propose that early in a star's life, the presence of planets or at least a proto-planetary disc, might slow down the star's rotation.

A slower rotational speed increases the depth of the star's convective layer, thus changing the amount of surface material mixing down into the interior.

This would result in more lithium being transported deep into the stars where it could be fused, increasing lithium depletion in its early stages.

Concerns

But Dr Charles Lineweaver of the Australian National University's Mt Stromlo Observatory remains sceptical.
Lineweaver says the researchers only looked at a narrow band of stellar surface temperatures.
He also believes that astronomers don't fully understand enough about how a star's convective layer thickness is influenced by the star's age or its rotational speed.

Lineweaver is also concerned that many of the stars listed in the study as having no detected planets, could actually have planets that simply haven't been detected yet.

Still, if the work of Israelian and colleagues is correct, it may provide an additional method of searching for extra-solar planets and possibly extraterrestrial life.

Quit Smoking, Get Diabetes?

By *News Account*

Created *Jan 4 2010 - 2:00am*

Although smoking is a well-known risk factor for type 2 diabetes, new research published in the January 5 issue of *Annals of Internal Medicine* suggests that quitting the habit may actually raise diabetes risk in the short term. Researchers found that people who quit smoking have a 70 percent increased risk of developing type 2 diabetes in the first six years without cigarettes as compared to people who never smoked.

The risks were highest in the first three years after quitting and returned to normal after 10 years. Among those who continued smoking over that period, the risk was lower, but the chance of developing diabetes was still 30 percent higher compared with those who never smoked.

The study enrolled 10,892 middle-aged adults who did not yet have diabetes from 1987 to 1989. The patients were followed for up to 17 years and data about diabetes status, glucose levels, weight and more were collected at regular intervals.

Type 2 diabetes is a common disease that interferes with the body's ability to properly use sugar, and to regulate and properly use insulin, a substance produced by the pancreas which normally lowers blood sugar during and after eating.

In type 2 diabetes, also known as adult-onset diabetes, the pancreas makes plenty of insulin to help the body when food is eaten, but the body cannot use it normally. The result is excess levels of blood sugar, which over time, can lead to blindness, kidney failure, nerve damage and heart disease. Overweight people and those with a family history of the disease have an increased risk for developing it, as do smokers, though the causal relationship is unclear.

According to the study, those who smoked the most and those who gained the most weight had the highest likelihood for developing diabetes after they quit. On average, over the first three years of the study, quitters gained about 8.4 pounds and saw their waist circumferences grow by approximately 1.25 inches.

Researchers suspect the elevated diabetes risk is related to the extra pounds people typically put on after renouncing cigarettes and caution that no one should use the study's results as an excuse to keep smoking, which is also a risk factor for lung disease, heart disease, strokes and many types of cancer.

Yeh and her colleagues want physicians to keep these findings in mind when they are consulting with patients who are giving up cigarettes, especially the heaviest smokers. They recommend considering countermeasures such as lifestyle counseling, aggressive weight management and the use of nicotine-replacement therapy, which seems to blunt the weight gain related to quitting. Another key step is more frequent blood glucose screening to assure the earliest detection of diabetes

Running shoes may cause damage to knees, hips and ankles

New York, NY, January 4, 2010 – Knee osteoarthritis (OA) accounts for more disability in the elderly than any other disease. Running, although it has proven cardiovascular and other health benefits, can increase stresses on the joints of the leg. In a study published in the December 2009 issue of *PM&R: The journal of injury, function and rehabilitation*, researchers compared the effects on knee, hip and ankle joint motions of running barefoot versus running in modern running shoes. They concluded that running shoes exerted more stress on these joints compared to running barefoot or walking in high-heeled shoes.

Sixty-eight healthy young adult runners (37 women), who run in typical, currently available running shoes, were selected from the general population. None had any history of musculoskeletal injury and each ran at least 15 miles per week. A running shoe, selected for its neutral classification and design characteristics typical of most running footwear, was provided to all runners. Using a treadmill and a motion analysis system, each subject was observed running barefoot and with shoes. Data were collected at each runner's comfortable running pace after a warm-up period.

The researchers observed increased joint torques at the hip, knee and ankle with running shoes compared with running barefoot. Disproportionately large increases were observed in the hip internal rotation torque and in the knee flexion and knee varus torques. An average 54% increase in the hip internal rotation torque, a 36% increase in knee flexion torque, and a 38% increase in knee varus torque were measured when running in running shoes compared with barefoot.

These findings confirm that while the typical construction of modern-day running shoes provides good support and protection of the foot itself, one negative effect is the increased stress on each of the 3 lower extremity joints. These increases are likely caused in large part by an elevated heel and increased material under the medial arch, both characteristic of today's running shoes.

Writing in the article, lead author D. Casey Kerrigan, MD, JKM Technologies LLC, Charlottesville, VA, and co-investigators state, "Remarkably, the effect of running shoes on knee joint torques during running (36%-38% increase) that the authors observed here is even greater than the effect that was reported earlier of high-heeled shoes during walking (20%-26% increase). Considering that lower extremity joint loading is of a significantly greater magnitude during running than is experienced during walking, the current findings indeed represent substantial biomechanical changes." Dr. Kerrigan concludes, "Reducing joint torques with footwear completely to that of barefoot running, while providing meaningful footwear functions, especially compliance, should be the goal of new footwear designs."

number 33

Why Fish and Red Wine Don't Mix

By Phil Berardelli 2009-10-25 16:50:51

For ages, diners have been told that drinking red wine while eating seafood can produce an unpleasant fishy aftertaste. The rule of thumb has been red wine with meat, white wine with fish. But the rule is not hard and fast. Seafood can taste fine with some reds, whereas some whites can ruin the meal. What's the common factor?
Researchers at Mercian Corp. in Fujisawa, Japan, a division of which produces wine and spirits, decided to find out. They conducted an experiment with seven experienced wine tasters who were offered 38 varieties of red and 26 types of white. Over four sessions, the volunteers tasted the samples, along with pieces of scallops, the seafood most likely to produce the fishy effect. Then the researchers chemically analyzed the wines for a possible link to the aftertaste.

The culprit appears to be iron, the team reports in a recent issue of the Journal of Agricultural and Food Chemistry. When the element's content rose above 2 milligrams per liter or so, the seafood-dining experience turned sour. The team double-checked their results by soaking pieces of dried scallops in samples of wine. Scallops dunked in vino with low iron content smelled normal, but pieces soaked in samples with high iron content reeked of fish.

The researchers report that they haven't yet isolated the compound in the scallops that reacts with the wine, but they suspect it's an unsaturated fatty acid, which could be breaking down rapidly and releasing the decaying fish smell when exposed to iron. How much iron a wine contains depends on the amount in the soil where the grapes were grown, as well as other factors such as how the grapes are harvested and processed. Red wine tends to have a higher iron content, hence the admonition against mixing it with seafood.

"We were surprised in our finding," says research chemist and lead author Takayuki Tamura, "because we thought that polyphenols or sulfur dioxide [produced] the unpleasant sensation." These components represent a larger percentage of wine content than does iron. He explains that because iron does not "induce color change, accelerated oxidation, or cloudiness," vintners tend to ignore its potential role as a meal-spoiler. But the new findings, he says, offer winemakers the opportunity to reconsider the downside of iron contamination.

The paper's science is sound, says enologist Gordon Burns of ETS Laboratories in St. Helena, California. Still, he says, there are better reasons to avoid red wine with fish: Any robust red wine, regardless of iron content, would likely overwhelm the delicate, subtle flavor of many seafood dishes. Red wine, he says, often pairs better "with a big stew or a hearty chunk of meat."

VACCINE MAY HEAD OFF GENITAL CANCER IN WOMEN

Therapeutic shots can wipe out precancerous growths caused by HPV

By Nathan Seppa

Web edition : Wednesday, November 4th, 2009

A series of shots can knock out genital lesions in women infected with a dangerous strain of human papillomavirus, or HPV, a new study finds. Although the experimental vaccine wasn't effective in everyone tested, most of the women showed benefits and many appear to have developed long-lasting immunity against this strain of HPV and the precancerous growths it can spawn.

Two other vaccines, Gardasil and Cervarix, have been approved to prevent HPV infection in girls and young women who have not yet been exposed to the virus. The new vaccine is different; it can successfully treat active HPV infection that has triggered the development of the precancerous growths, researchers report in the Nov. 5 *New England Journal of Medicine*.

"This is a wonderful demonstration that these lesions can go away with vaccination," says cancer immunologist Olivera Finnof the University of Pittsburgh School of Medicine. In the best-case scenario, these shots will deliver long-lasting protection, but only large-scale testing and extended follow-up will establish that, Finn says.

Researchers recruited 20 women who had such skin lesions affecting external genital tissue. The tissue abnormalities, caused by HPV-16, the most common cancer-causing strain of the virus, cause pain, itching and burning, says study coauthor Gemma Kenter, a gynecologist who worked on the study while at Leiden University in the Netherlands. Although the lesions can be removed with laser treatment or surgery, they commonly recur, says Kenter, now at VU University Amsterdam.

All the volunteers received the new vaccine in a series of three or four injections that contain synthetic versions of two HPV proteins, dubbed E6 and E7. The vaccine alerts the immune system to produce T cells — a type of white blood cell — that will target any cells making these proteins.

Two years after vaccination, these vulvar intraepithelial lesions had disappeared in nine women and showed partial improvement in four others. One additional participant appeared to benefit but died of heart failure before the trial was completed.

Six women failed to improve. While it remains unclear why six women derived no benefit, Kenter says, all had large lesions and most had been fighting the precancerous growths for 10 years or more.

The new vaccine mobilizes T cells, immune agents that can root out viruses that have already invaded a cell, says Finn. Viruses survive by incorporating their DNA into a cell's genetic material. The resulting genetic changes induce HPV-infected cells to produce viral proteins, which contribute to a cell's aberrant growth.

However, cells making E6 and E7 proteins get the attention of roving T cells. These immune sentinels respond by pouring out interferon-gamma, a cell-signaling molecule. It serves as a fire alarm, attracting immune troops to kill HPV-infected cells.

HPV is extremely common, often infecting women without causing symptoms. The new vaccine mimics the way most women clear HPV infections without ever developing lesions or cancer.

Among women who benefitted from the vaccine in the new study, the body cleared out infected cells, which Gardasil and Cervarix vaccines have not been shown to do, Kenter says. Those vaccines stimulate production of antibodies that lie in wait for newly arriving viruses — which makes them very effective in girls and young women who have never been exposed to HPV. It remains unclear how effective those vaccines will be for women in their 20s and older who may have a latent HPV infection, Kenter says.

For now, the goal will be to use the new vaccine therapeutically – if it gets approval — in women with precancerous genital lesions, Kenter says. The Dutch team is already working on a larger trial.

BBC NEWS

New way to 'stop' premature birth

The Newcastle University team tested the drug Trichostatin A on tissue taken from 36 women undergoing a caesarean.

The researchers said the therapy worked by increasing the levels of a protein that controls muscle relaxation.

One expert said with rates of premature births rising - there are 50,000 a year in the UK - a new treatment was badly needed.

" **When you consider that preterm birth rates are rising in all four countries of the UK a new more effective drug is badly needed** "
Professor Jane Norman, RCOG

Preterm labour and birth continue to be the single biggest cause of death in infants in the developed world and around 1,500 babies die in the UK every year.

A number of drugs are used to try to stop early labour, but most have serious side effects.

Trichostatin A (TSA) is known to promote the death of cancer cells.

The researchers got permission to take samples of the muscles of women undergoing caesarean sections at the Royal Victoria Infirmary in Newcastle, the Cellular and Molecular Medicine journal reported.

Contractions

They exposed the muscle to TSA and measured the effects on both spontaneous contractions and those induced by the labour drug, oxytocin.

They found an average 46% reduction in contractions for the spontaneously contracting tissue and an average 54% reduction in the oxytocin induced contractions.

It has been previously shown that a protein kinase A (PKA) is involved in controlling the relaxation of the uterus during pregnancy.

The researchers showed that TSA increased the levels of a protein sub-unit of PKA.

Professor Nick Europe-Finner, who led the research, said: "We will not give this drug to a patient because it can damage as many as 10% of the genes in a cell.

"But it does show us that other more specific agents that act on the same enzymes but only one at a time are worth investigating."

New treatment

Dr Yolande Harley, deputy director of research at Action Medical Research which funded the study, said: "This project has uncovered some of the molecular pathways that regulate uterine contractions and so could be linked to premature birth.

"It could have a role in preventing premature birth - finding a new treatment for early labour would be a major step forward."

Professor Jane Norman, a spokeswoman for the Royal College of Obstetrics and Gynaecology (RCOG), said: "At the moment, it's not possible to treat preterm labour effectively. We only have drugs that delay it by 24 hours or so - not enough to deliver the baby safely.

"One of the interesting things about this research is that they are using a new kind of drug - the drugs we are currently using have been around for a long time.

"And they are targeting pathways we have not known about before.

"When you consider that preterm birth rates are rising in all four countries of the UK a new more effective drug is badly needed."