



Introduction

Wh-scope marking (WSM) is found in many languages, including German (McDaniel, 1989), Hindi (Dayal, 1994), and Hungarian (Horvath, 1995), among others. It is typified by the use of a wh-phrase in each clause, as seen in (1, German), and is said to alternate with Long-Distance (LD) questions (seen in 2) in only some of these languages.

(1) **Was** glaubst du, **mit wem** Maria gesprochen hat? **What** think you, **with whom** Maria spoken has? *With whom do you think Maria spoke?*

(2) **Mit wem** glaubst du dass Maria gesprochen hat? **With whom** think you that Maria spoken has *With whom do you think Maria has spoken?*

Exs. From (Dayal (1995), 1b)

Previous Accounts of WSM:

Direct Dependency Account (DDA): The first wh-phrase marks scope for the second wh-phrase. Carries no content. LD and WSM have the same meaning. A syntactic analysis. (McDaniel, 1989)

Indirect Dependency Account (IDA): Both contentful wh-phrases. The second limits the scope of possible answers to the first. LD and WSM do not have the same meaning. A semantic analysis. (Dayal, 1995)

Problem:

Neither IDA nor DDA successfully account for all WSM languages. Herburger (1994) describes subtle semantic differences between LD and WSM structures in German (contra DDA). Horvath (e.g., 2000) suggests Hungarian seems compatible with syntactic analysis of IDA, but semantic analysis of DDA.

Goals of the Present Study:

Establish the mapping of meaning to form (WSM vs. LD vs Sequential questions (SeqQs, as in 3) using a survey.

(3) **Was** glaubst du? **Mit wem** hat Maria gesprochen? **What** think you? **With whom** has Maria spoken? *What do you think? With whom has Maria spoken?*

Model this meaning to form pairing: Optimality Theory (Prince & Smolensky, 1993/2004; Legendre et al., 2001).

Establish a unified account for the cross-linguistic variation:

English: LD, SeqQs, no WSM
Hindi: WSM, SeqQs, no LD
Hungarian: WSM, SeqQs, LD highly limited
German: WSM, LD, WSM

What does a speaker *mean* when they use each of these forms?

What does a speaker do when a form is not available in their language?

Cross-linguistic Survey

Survey Design:

We identified 3 semantic/pragmatic factors which might affect the use of particular structures and controlled for these factors in our stimuli.

1) **Question Under Discussion (QUD)** (Roberts 1996, 2012): we controlled for whether the “second question (Q2)” – the embedded clause wh-phrase in a WSM structure - was resolved/unresolved. (e.g. does the speaker know with whom Maria spoke in (1)?)

2) **Contrastive Topic (CT)** (Büring, 2003): Wagner (2012) argues that the entity which receives CT must have higher scope than any other focused entity. We controlled for whether the subject of the matrix clause (e.g., “you” in (1)) was presented in contrast to other entities.

3) **Register** (Ure & Ellis, 1977): Specific language patterns are used in certain situations including adult vs. child directed speech. We controlled for whether questions were posed to children or adults.

Scenarios & Questions:

8 combinations of the above conditions, 4 scenarios for each: 32 scenarios followed by forced choice task of selecting the “best” question

Sample: Q2 is resolved; Subject is CT; Child Directed

Jack has taken his three sons to a waterpark. They are looking for the way to their favorite ride. The two littlest boys are arguing at a fork in the path: should they go right or left? Stephen thinks he remembers the ride is to the left, while Andrew thinks it is to the right. Jack sees a sign that says the ride is off to the right. Christopher is just beginning to learn to read. Jack bends down and points at the sign, saying:

Christopher, what do **you** think? Where is the ride?

Christopher, where do **you** think the ride is?

Christopher, what do **you** think?

Christopher, where is the ride?

*Questions were recorded by native speakers to ensure appropriate prosody

Participants recruited using Amazon Mechanical Turk (MTurk). We included 16 filler questions and eliminated participants who missed more than 3 of these. Native speakers of English (n=12), Hindi (n=10), Hungarian (n=14), or German (n=12).

Resulting Optimal Outputs by Language

Input	Q2 unresolved; Sub CT; Adult	Q2 unresolved; Sub CT; Child	Q2 unresolved; Sub not CT; Adult	Q2 unresolved; Sub not CT; Child	Q2 resolved; Sub CT; Adult	Q2 resolved; Sub CT; Child	Q2 resolved; Sub not CT; Adult	Q2 resolved; Sub not CT; Child
English	LD	LD	LD	LD	LD	LD	LD	LD
German	SeqQ	SeqQ	WSM	SeqQ	LD	SeqQ	WSM	SeqQ
Hindi	WSM	SeqQ	WSM	WSM	WSM	SeqQ	WSM	WSM
Hungarian	WSM	Mono-clausal Q2	WSM	WSM	WSM	WSM	WSM	WSM

Optimality Theory Analysis

Input-Output Mapping Architecture: The input contains the features we controlled for: QUD status, CT, Register.

Constraints: We identified 10 Constraints with which we modeled the optimal outputs using variation in constraint rankings across languages. (1)- (5) are output oriented. (6)-(10) are constraints on input-output mapping

- MINPROJ** (Grimshaw 1993, 1997): Syntactic projections should be minimal
- *t** (Legendre et al., 1995, 1998): No syntactic movement
- WH-CRIT(ERION)** (Müller, 1996): Wh-items surface in a specCP whose head is +Q.
- MINLINK** (Legendre et al. 1995, 1998; Legendre, 2010): Links between traces should be minimal. Longer links are less harmonic than shorter links.

Tableau 1. German. One unresolved QUD, Adult-directed, Subject is CT, Attested output: LD

Input	FAITH C	FAITH CT	MIN-PROJ	WH-CRIT	MIN-PROJ	*t	MARK FOC	FULL INT
-R QUDs: 1, Adult, Subj not CT	Reg.	FAITH CT	FAITH LFSYN	MIN-PROJ	WH-CRIT	*t	MARK FOC	FULL INT
LD	***	***	***	***	***	***	***	***
WSM with movement	**	***	***	***	***	***	***	***
WSM with movement to FocP	**	***	***	***	***	***	***	***
WSM without movement	**	***	***	***	***	***	***	***
SeqQs with movement	**	***	***	***	***	***	***	***
SeqQs without movement	**	***	***	***	***	***	***	***
Mono. Q	**	***	***	***	***	***	***	***
Mono. Q without movement	**	***	***	***	***	***	***	***
Mono. Q with FocP	**	***	***	***	***	***	***	***

5) **MARKFOCUS:** Syntactic phrases with a focus feature appear in FocP.

6) **FAITH LF/SYN:** The output reflects the relative scope of verbs in the input.

7) **FULLINT(ERPRETATION)** (Grimshaw, 1997): A lexical item has an interpretation at LF.

8) **FAITH QUD:** The number of true wh-phrases ([+wh] lexical items that carry content) reflects the number of unresolved QUDs, specified in the input.

9) **FAITH CT:** The item marked as CT in the input has highest focus scope in the output.

10) **FAITH C(HILD) REG(ISTER):** be simple

Tableau 2. German. One unresolved QUD, Adult-directed, Subject not CT, Attested output: SeqSM

Input	FAITH C	FAITH CT	MIN-PROJ	WH-CRIT	MIN-PROJ	*t	MARK FOC	FULL INT
-R QUDs: 1, Adult, Subj not CT	Reg.	FAITH CT	FAITH LFSYN	MIN-PROJ	WH-CRIT	*t	MARK FOC	FULL INT
LD	***	***	***	***	***	***	***	***
SeqSM with movement	***	***	***	***	***	***	***	***
WSM with movement to FocP	***	***	***	***	***	***	***	***
WSM without movement	***	***	***	***	***	***	***	***
SeqQs with movement	***	***	***	***	***	***	***	***
SeqQs without movement	***	***	***	***	***	***	***	***
Mono. Q	***	***	***	***	***	***	***	***
Mono. Q without movement	***	***	***	***	***	***	***	***
Mono. Q with FocP	***	***	***	***	***	***	***	***

Discussion & Conclusion

General Discussion:

- There is cross-linguistic variation on when native speakers use WSM, LD, and SeqQs.
- This variation can be modeled using OT syntax
- Our analysis ties input and output pairings.
- Using OT syntax allows us to create a unified analysis of the use of WSM, LD, and SeqQs in these four languages.

Future Work:

- We are currently in the process of conducting follow up studies with more participants using “Prolific” with the goal of including more participants from a more reliable pool.
- This follow up also removes the monoclausal questions from the options.

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