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This construction is too hot to handle: A corpus study of an adjectival construction*
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1. Introduction

The expression *too hot to handle* has surfaced in many lyrics in popular music over the years, perhaps most famously in the classic UFO song in which it serves as the title. The underlying syntactic structure of the expression – namely [*too* ADJ *to* V] – is of course not exclusive to classic rock lyrics, but appears in everyday language, as exemplified below:

(1)   The tatty furniture betrayed elegant lines, and the windows, too grimy to see through, stretched up ten feet. (COCA 2011 FIC Bk:NeverGentleman)
(2)   After all, when my children were preteenagers and too young to handle last-minute flight cancellations or heavy turbulence on their own, the programs offered considerable peace of mind. (COCA 2011 NEWS NYTimes)
(3)   Pa fell through the ice in March, but the ground was still too frozen to dig a grave. (COCA 2011 FIC BoysLife)

All three examples seem to set up a force-dynamic relation between the adjective and the scenario predicated by the infinitive verb (we will call this the V-scenario henceforth), such that the property expressed by the adjective serves to block the V-scenario.

   Assuming that [*too* ADJ *to* V] is a grammatical construction (Fillmore et al. 1988, Goldberg 1995, Croft 2001), this paper presents a corpus-based study of [*too* ADJ *to* V] whose purpose is to shed some light on how the underlying semantic relations pertaining to the ADJ-V interaction in the construction are reflected in its patterns of use. Our main premise is that language use informs language competence, such that usage-patterns shape the language system itself; in other words, we are interested in the usage-patterns of this adjectival construction because we take it that usage – because language competence is experientially based on usage – reflects the language system.

2. Theoretical framework: usage-based construction grammar and scalar adjectival constructions
This section briefly introduces the main principles of usage-based construction grammar and then offers a definition of the concept of a scalar adjectival construction.

2.1 Usage-based construction grammar
Construction grammar is a family of related, largely cognitively oriented, theories of grammar, which share a number of basic tenets (e.g. Fillmore et al. 1988, Goldberg 1995, Croft 2001). The grammatical construction is the central theoretical concept in all versions of construction grammar. A construction is a symbolic unit which pairs linguistic form with conventionalized semantic and pragmatic meaning.

   Usage-based construction grammar embraces the principles of usage-based linguistics (Kemmer & Barlow 2000) in which the language system is experientially based on language usage. Croft (2005: 274) suggests a usage-based definition of a construction as "an entrenched routine ..., that is generally used in the speech community ... and involves a pairing of form and meaning." Retaining the construction as a symbolic unit, Croft's definition adds the function of language as a means of communication in a speech community and, indirectly perhaps, includes the notion of convention as a socio-communicative phenomenon. Moreover, describing it as an entrenched routine, Croft implies that constructions are conventionalized – in individuals and in the speech community – through frequency of use.

   It is generally held in construction grammar that "linguistic knowledge at all levels, from morphology to multi-word units can be characterized as constructions, or pairings of form and meaning" (Bergen & Chang 2004: 145) and that such linguistic knowledge is organized into constructional networks which are subject to general cognitive organizational principles and processes. Embracing usage-based inheritance, usage-based construction grammar operates with constructional networks characterized by prototype effects, necessary redundancy, and a considerable level of delicacy. Thus, usage-based constructional networks typically include item-class-specific and item-specific constructions (Croft 2003: 57-58, Tomasello 2003: 139). An item-class-specific construction evolves around a specific lexical class and has a specific communicative function; an item-specific construction evolves around just a single lexical item and has a specific communicative function.

As we will see in a moment, the [*too* ADJ *to* V]-construction may be treated as an item-class-specific construction, whose network covers a number of communicatively more specific subconstructions.

2.2 Scalar adjectival constructions

The [*too* ADJ *to* V]-construction is characterized as an adjectival construction. By this, we understand a construction in which an adjectival element plays a semantically or functionally pivotal part. More specifically, we classify it as a scalar adjectival construction, which is an adjectival construction that draws on the SCALARITY of gradable, or gradably construed, adjectives.

Scalar adjectival constructions have two defining features. Firstly, a scalar adjectival construction contains an adjectival head which provides the adjectival meaning (which we refer to as ADJNESS). Secondly, it contains a degree modifier. The degree modifier has two functions: 1) it construes the ADJNESS as a scale, and 2) it specifies a degree of ADJNESS. Adjectival SCALARITY is central to the construction and constitutes a pivotal component of the semantic relations underlying the construction. An example of this is the [*so* ADJ *that* X] in which [*that* X] is a clause which expresses a scenario that follows as a consequence of the degree of ADJNESS expressed by [*so* ADJ]. In other words, there is an implied force-dynamic relation between [*so* ADJ] and [*that* X]:

(4)   It was so cold in the kitchen that there was frost on the lettuce. (Bergen & Binsted 2004: 84)

In (4), *so cold* construes a high degree of COLDNESS, making *so* a booster type degree modifier (Paradis 2000: 149). *That there was frost on the lettuce* is presented as a situation that follows from the high degree of COLDNESS, such that the relation between the two elements is one of CAUSATION. That is, the degree of COLDNESS is the cause of there being frost on the lettuce.

[*Too* ADJ *to* V] is not dissimilar to the [*so* ADJ *that* X]-construction. *Too* is also a booster type modifier, and an implied relation of force-dynamics is set up between [*too* ADJ] (and the main clause in which it occurs) and the V-scenario. Consider this example:

(5)   They're too slow to catch a seal in open water. (COCA 2011 MAG NationalGeographic)

In this case, *too slow* construes SLOWNESS as a scale and sets up a high degree of SLOWNESS. An implied force-dynamic relation is set up between this element and *to catch a seal in open water*, but unlike in (4), the implied force-dynamic relation in (5) is one of PREVENTION. That is, the degree of SLOWNESS is construed as being so high that it prevents the catching of a seal in open water from taking place. This force-dynamic relation of PREVENTION is also at play in (1-3).

3. Data and method

The present study is based on an investigation of the 2011-section of the *COCA* (Davies 2013), which contains 20,445,868 words and captures naturally occurring language in the domains of fiction, magazines, newspapers, academic texts, and speech; 1189 instances of the construction were found in the corpus.

The 1189 instances were subjected to qualitative and quantitative analyses. In the qualitative analysis, the syntactic, semantic and symbolic relations in every instance were identified. The next step was, treating the identified relations as categories of semantic association patterns, to perform frequency analyses of these. Association patterns are defined as "the systematic ways in which linguistic features are used in association with other linguistic and non-linguistic features" (Biber et al. 1998: 5). I subjected the data to a simple frequency analysis, which did provide some insight into the usage-patterns of the construction. However, a more advanced method was required in order to unearth the underlying semantic relations and provide a more in-depth overview of the usage-patterns of a construction.

To meet this end, I applied all three variants of collustructional analysis (Stefanowitsch & Gries 2003, 2005; Gries & Stefanowitsch 2004). Collostructional analysis allows the analyst to measure the strength of attraction between a lexeme and a construction, referred to as collostruction strength. Given the principles of semantic compatibility (Stefanowitsch & Gries 2005: 4) and semantic coherence (Stefanowitsch & Gries 2005: 11) – which hold that words are typically attracted to constructions that they are semantically compatible with – identifying the lexemes that are attracted to a construction may provide us with insights into the semantics of the construction itself. The collustructional analyses will briefly be described here. (Simple) collexeme analysis measures of the degree of attraction, or collostruction strength, of a lexeme to a

position in a construction. For a detailed overview of this type of analysis, see Stefanowitsch & Gries (2003). Distinctive collexeme analysis measures the degrees of attraction of a lexeme to two, or more, constructions. Distinctive collexeme analysis can be used to identify any semantic differences between these constructions. For a more detailed introduction to distinctive collexeme analysis, see Gries & Stefanowitsch (2004). Covarying collexeme analysis measures the coattraction of multiple lexemes that appear in a construction. Covarying collexeme analysis may indicate underlying semantic relations in the construction itself. For a fully fledged introduction to this type of collostructional analysis, see Stefanowitsch & Gries (2005).

I applied the collexeme analysis to the ADJ-position, measuring attraction patterns of adjectives to this position. The coattraction patterns of lexemes in the ADJ-position and the V-position were measured using a covarying collexeme analysis. Finally, distinctive collexeme analysis was applied to the ADJ-elements of the subconstructional categories identified in the qualitative analysis. I used Gries (2007) for all collostructional analyses in this study.

4. The construction in use

The qualitative analysis yielded some interesting results. It turns out that the construction subsumes number subconstructional types which differ semantically. Two major category sets seem to revolve around force-dynamics and fall under two headings: 1) relations between ADJ- and V-positions and 2) referential identity relations between one or more elements in the main clause in which [*too* ADJ *to* V] appears and a participant in the V-scenario.

The first category set covers two categories, which are exemplified below:

(6)   I'm too depressed to see straight. (COCA 2011 FICT RedCedarRev)
(7)   I am only too happy to provide what little help I can. (COCA 2011 FIC Bk:AliceIHaveBeen)

The instance in (6), like in (1-3, 5), sets up a relation of PREVENTION between the degree of ADJNESS and the infinitive clause. The instance in (7), in contrast, sets up a relation of ENABLEMENT between the degree of ADJNESS and the infinitive clause, such that the V-scenario is enabled, or allowed, by the high degree of ADJNESS. These two force-dynamic relations may be traced back to Johnson's (1987) image schemata of BLOCKAGE and ENABLEMENT respectively. These two implied force-dynamic relations are accompanied by another implied semantic component – namely, what we could call the MAX-OUT THRESHOLD. Any degree of ADJNESS above this threshold is construed as making impossible the V-scenario. Thus, in the PREVENTION type, the degree of ADJNESS is construed as exceeding the MAX-OUT THRESHOLD, resulting in a blockage of the scenario, while it is construed as not exceeding the threshold in the ENABLEMENT type, such that the degree of ADJNESS enables the scenario.

The second category set covers three categories, examples of which are given below:

(8)   A $25 donation to the IRC can supply one dehydrated child who is too weak to eat or drink with an IV kit and fluids for two days. (COCA 2011 MAG Redbook)
(9)   It's too sophisticated to have been programmed by some punk teenager. (COCA 2011 MAG PopMech)
(10)   It's too dark to see her eyes. (COCA 2011 FIC BK:LimeCreekFiction)

In the category represented by (8), there is zero-anaphoric referential identity between an unexpressed PRIMARY PARTICIPANT (a DOER or other AGENTIVE type of participant role) in the V-scenario and an antecedent in main clause, while there is anaphoric referential identity between the SECONDARY PARTICIPANT (a DONE-TO or other PATIENTIVE type of participant role) in the V-scenario and an antecedent in the main clause in the category represented by (9). In the category represented by (10), there is no referential identity. Instead, the ADJNESS expressed by the adjective serves as a PROPERTY of the scenario of the main clause, or of an element in that scenario, and as a CONDITION in the V-scenario. This CONDITION has a direct force-dynamic influence on the V-scenario.

This is in itself an interesting finding, but, in order to better understand the nature of the construction, these categories must be quantified which will reveal to us some of the usage-patterns of the construction. A simple frequency analysis, for instance, shows that the PREVENTION and ENABLEMENT types are not used equally frequently:

Table 1: Force-dynamic relations

Relation type	Frequency
Enablement	n = 43 (3.8%)
Prevention	n = 1089 (96.2%)

p = 7.39e-154

Table 2: Relations of referential identity

Participant role type in V-scenario	Frequency
Primary role	n = 680 (60.1%)
Secondary role	n= 262 (23.1%)
Condition	n = 190 (16.8%)

p = 5.54e-39

This gives us an insight into the basic distribution of usage-patterns of the construction, but it does not verify the patterns themselves. This is where our collostructional analyses come into the picture.

Consider first the top ten attracted lexical items in the ADJ-position generated via our collexeme analysis:

Table 3: Top 10 attracted items in the ADJ position

Rank	Lexeme	Collostruction strength	Rank	Lexeme	Collostruction strength
1	early	677.00759229121	6	good	317.591527127464
2	busy	666.448099991938	7	old	279.666675859592
3	young	623.149878585395	8	weak	259.278759213788
4	late	574.118935192231	9	small	250.572920981746
5	big	346.708021280216	10	tired	238.609461040527

As we can see, the ten most strongly attracted lexical items to the ADJ-position are conventionally gradable adjectives. This is symptomatic of the majority of adjectives that appear in this position in the 2011 portion of the *COCA*. In fact, it is only in the bottom 50 (out of 309 lexemes) that we encounter non-gradable adjectives, such as *pregnant*, *female* and *Catholic*. This observation suggests that, although the adjectives occurring in this position are semantically diverse, they share the semantic component of SCALARITY; provided that we accept scalar adjectives as a superordinate semantic class of adjectives, this means that [*too* ADJ *to* V] is technically an item-class-specific construction evolving around the semantic SCALARITY of the ADJ-position. This observation further supports our classification of the construction as a scalar adjectival construction.

Next, consider the top twenty coattracted lexical items, generated by our covarying collexeme analysis:

Table 4: top 20 coattracted lexical items

Rank	ADJ	V	Collostruction strength	Rank	ADJ	V	Collostruction strength
1	good	be	137.541973606126	11	dark	see	23.7372911654156
2	big	fail	124.214583952871	12	dangerous	release	22.6207239909575
3	early	tell	74.7141307967985	13	heavy	lift	22.5634901460064
4	early	say	65.1619493422168	14	busy	bother	22.4968554430303
5	willing	compromise	32.0301027919704	15	young	remember	22.4492007417720
6	precious	wear	30.3655661037372	16	early	gauge	22.2529058825033
7	late	change	30.1348488072069	17	quick	dismiss	21.8478093852388
8	numerous	count	28.7796928062779	18	excited	sleep	19.9901227360955
9	happy	oblige	27.5455085556661	19	hot	sustain	18.5373716482582
10	young	understand	25.2878140994993	20	disabled	stand	18.1884420908535

Several of the coattracted pairs display semantic coherence understood such that the two lexical items are semantically compatible with each other. More specifically, this relation of semantic coherence specifies force-dynamic relations such that the property expressed by the adjective in a pair has a logical influence on the scenario predicated by the verb, as in *numerous-count*, *heavy-lift*, *dark-see*, *dangerous-release*, *excited-sleep*, and *disabled-stand*. In some cases, the relation seems to be more culturally based, as in *early-tell*, *early-say*, and *early-gauge* (drawing on a cultural model of temporal appropriateness of evaluation or assessment), *young-understand* and *young-remember* (drawing on a cultural model of the correlation of age and mental capacity), or *willing-compromise* and *happy-oblige* (drawing on cultural models of motivations for acts of social sacrifice). Note that, the relation in the last two pairs just mentioned is one of ENABLEMENT, while the rest of the pairs mentioned feature adjectives that express properties that have preventive effects on

the propositions predicated by their respective V-elements. Such intra-pair relations are symptomatic for the majority of the coattracted pairs in the corpus, which I take as evidence that supports the validity of the PREVENTION and ENABLEMENT types proposed in our qualitative analysis.

Lastly, we will turn to our distinctive collexeme analysis. Either category set identified in the qualitative analysis was subjected to a distinctive collexeme analysis; that is, the observed categories were treated – in accordance with the principles of usage-based construction grammar – as communicatively and cognitively specific subconstructions. The distinctive collexeme analysis applied to the PREVENTION/ENABLEMENT category set revealed that a very small set of eight adjectival lexemes strongly preferred the ENABLEMENT type, while the remaining adjectives preferred the PREVENTION type. Here is an overview of the eight ADJ-items that preferred the ENABLEMENT type:

Table 5: ADJ-items that prefer the enablement type

Rank	Lexeme	Collostruction strength	Rank	Lexeme	Collostruction strength
1	happy	89.260926217908	5	anxious	19.8243266312754
2	willing	46.9387441340836	6	ready	19.8243266312754
3	eager	40.0831186240193	7	easy	13.1695906448345
4	quick	37.5343608571090	8	likely	13.1695906448345

Note that half of these are adjectives that specify action-motivating human emotions (*happy*, *willing*, *eager*, and *anxious*), while *ready*, *easy*, and *likely* quite obviously express various other kinds of action-enabling properties. Furthermore, the ADJ-element that has the strongest preference for the PREVENTION type (*early*) has a collostruction strength of 5.77098531119765. That is less than 50% of the strength of attraction of *likely* and *easy* to the ENABLEMENT type. These observations are quite compelling. The ENABLEMENT-related semantics of the majority of the ADJ-elements that prefer the ENABLEMENT type, I would say, is a verification of the ENABLEMENT type itself. Moreover, the very strong preference that this small set of adjectives has for the ENABLEMENT type suggests that the ENABLEMENT type is a less general and more specialized subconstruction than the PREVENTION type (this claim is further validated by the generally low frequency of the enablement type in our corpus).

The distinctive collexeme analysis applied to the three categories of referential identity also yielded some interesting results. Firstly, among the lexemes that prefer the PRIMARY PARTICIPANT type, we find a considerable number of adjectives belonging to Dixon's (2004) class of human propensity adjectives such as *busy*, *tired*, *happy*, *afraid*, *drunk*, *embarrassed*, *nervous*, *dumb*, *lazy* and *polite*. The number of human propensity adjectives that prefer the SECONDARY PARTICIPANT role type is much smaller. The explanation for this lies in human cognition. We can assume that, cognitively, we are more likely to assign AGENTIVITY to beings that we perceive as having high ANIMACY (such as humans as well as pets and other personified entities) than to entities with low, or no, ANIMACY. Thus, it makes sense that instances of the PRIMARY PARTICIPANT type are more strongly associated with human propensity adjectives than instances of the SECONDARY PARTICIPANT type. I take this to indicate the the two types do indeed serve slightly different communicative purposes, which warrants treating them as subconstructions of [*too* ADJ *to* V]. Secondly, the CONDITION type was preferred by a small set of lexemes, including *early*, *late*, *dark*, *cold*, *dim* and *mild*. Interestingly, these lexical items are quite often used to describe SCENERY FEATURES, for want of a better term, such as TIME (*early*, *late*), TEMPERATURE (*cold*), and ATMOSPHERE (*dark*, *dim*, *mild*). It is not surprising that this type of adjective is associated with the CONDITION type, as all of these lexemes express properties that, in human experience, often interact with or even determine activities and situations. For instance, humans see better in the light than in the dark which is reflected in the coattraction of *dark* and *see* in the PREVENTION subconstruction, and in the preference of *dark* for the CONDITION type.

5. Concluding remarks

We were interested in shedding light on the semantic contribution of the ADJ-element in the [*too* ADJ *to* V]-construction and how the ADJ-element semantically interacts with the infinitive clause.

Our corpus-based study of [*too* ADJ *to* V] has taught us a number of things. Firstly, our collexeme analysis shows that the ADJ-position attracts primarily gradable adjectives, which logically suggests that the construction is an item-class-based construction revolving around scalar adjectives. This is what makes the construction a scalar adjectival one. The SCALARITY of the the ADJ-element is pivotal to the semantics of the construction, as the degree modifier *too* – which is a booster – construes a high degree of ADJNESS which

enters into a force-dynamic relation with the V-scenario. Two types were identified in the corpus – namely, the PREVENTION type, in which the high degree of ADJNESS blocks the V-scenario, and the ENABLEMENT type, in which the degree of ADJNESS enables the V-scenario. These relations are reflected in the patterns of coattraction among the lexical items realizing the ADJ- and V-elements in the corpus, in that many of the ADJ-V pairs themselves display relations of semantic coherence that reflect force-dynamic relations of BLOCKAGE and ENABLEMENT. We also identified three types based on relations of referential identity between elements in the main clause and participant roles in the V-scenario. In one type there is referential identity between a PRIMARY PARTICIPANT in the V-scenario and an element in the main clause. The second type was one in which there is referential identity between a SECONDARY PARTICIPANT role and an element in the main clause. The difference between these two types was reflected in the fact that, according to our distinctive collexeme analysis, adjectives of human propensity preferred the former to the latter. The third type was one in which the ADJ-element served to set up a CONDITION in the V-scenario, reflected by the preference of SCENERY-related adjectives for this type.

While the present study has provided what I consider quite valuable information on the [*too* ADJ *to* V]-construction, it is obviously far from conclusive. A number of questions remain to be answered, such as whether there are other distinctions between the PREVENTION and ENABLEMENT types, for instance in terms of what Fillmore (1988: 36) calls external properties. Moreover, the matter of the construction's interaction with cultural models must also be explored further. Also, in order to verify or falsify the findings in the present study and to identify more features of the construction, more research into [*too* ADJ *to* V] is definitely needed. The present study has merely provided what is ultimately an empirically based hypothesis about the construction its underlying semantic relations, and its discursive behavior.

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