Korean and Spanish psych-verbs: Interaction of case, theta-roles, linearization, and event structure in HPSG

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Abstract

In this paper, we argue that by making a more detailed distinction of theta-roles, while at the same time investigating the correlation of case marking, theta-role assignment, and eventuality types, we can describe different psych-verb subclasses and explain their alignment patterns in Spanish and Korean. We propose a neo-Davidsonian treatment of psych-verbs in HPSG that allows us to account for the underspecification of theta-roles which are modeled in an inheritance hierarchy for semantic relations. By assuming linking properties modeled lexically, we can constrain the properties for psych-verbs that shows the mapping of semantic arguments (i.e. *experiencer*, *stimulus-causer*, *subject matter* and *target*) to the elements in the argument structure. The type hierarchy and lexical rules proposed here capture the alternation in case marking not only of the experiencer (as traditionally assumed in the literature), but also of the stimulus. This analysis leads us to a new fourfold classification of psych-verbs for both languages.

1 Introduction

Psychological verbs (henceforth psych-verbs), such as English *frighten, worry, anger*, have caused large interest due to their particular properties and their implications for the theory of argument structure (cf. Belleti & Rizzi, 1988; Grimshaw, 1990; Pesetsky, 1995; Landau, 2010, a.o.). The configuration of these verbs contains two arguments: (a) an EXPERIENCER (EXP), which is an animate individual affected by a psychological eventuality; and (b) a STIMULUS (STM), which refers to an animate or inanimate entity that triggers the psychological state in the EXP (cf. Pesetsky, 1995). The literature classifies these verbs into two classes according to their argument and event structures: (a) experiencer-subject (ES) verbs, e.g. *love* and *fear* (1a); and (b) experiencer-object (EO) verbs, e.g. *frighten* and *worry* (1b).

(1) a. $\text{Clara}_{\text{EXP}}$ loves $\text{David}_{\text{STM}}$.
b. $\text{David}_{\text{STM}}$ frightens $\text{Clara}_{\text{EXP}}$.

The EO class has been further divided into those verbs that only assign dative to the experiencer (e.g. Spanish *gustar* 'like' cf. (6)), and those that alternate the experiencer between accusative (the structural case for objects)

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and dative (henceforth DAT/ACC alternation), e.g. Spanish *asustar* 'frighten' (cf. (3) and (2), respectively) (cf. Van Voorst, 1992; Arad, 1998). There is a general agreement that for the ES class, verbs denote states (Grimshaw, 1990). However, this is not the case for the EO class, which are categorized as accomplishments (cf. Van Voorst, 1992), causative state/events (cf. Arad, 1998; Pylkkänen, 2000), and recently as inchoative states (cf. Bar-el, 2005; Marín & McNally, 2011). In addition, EO verbs also show exceptional syntactic properties; one of those being linearization. Empirical studies have demonstrated that the preferred word order in dative (DAT) structures is that of EXP-DAT > STM-DAT (2); whereas in accusative (ACC) constructions, the preferred word order is that of STM-NOM > EXP-ACC (3) for a number of languages (for Spanish cf. Fábregas et al., 2017; for German, Greek, Hungarian, and Korean cf. Temme & Verhoeven, 2016; for English and Polish cf. Jiménez-Fernández & Rozwadowska, 2016).

(2) [A Clara]$_{\text{EXP}}$ le asusta [David / el reporte]$_{\text{STM}}$.
to Clara CL.DAT frightens David the report
'David / the report frightens Clara.'

(3) [David / el reporte]$_{\text{STM}}$ (la) asusta [a Clara]$_{\text{EXP}}$.
David the report CL.ACC frightens to Clara
'David / the report frightens Clara.'

Less attention has been paid to the class of ES psych-verbs, which show a canonical word order as in SUBJ$_{\text{EXP-NOM}}$ > OBJ$_{\text{STM-ACC}}$; and contrary to the EO psych class that presents a DAT/ACC alternation of the EXP, it has been claimed to have no alternation in case marking of the stimulus-object (cf. Belleti & Rizzi, 1988). However, there is data showing that this is not the case, at least for languages such as Spanish, where verbs as *temer* 'fear' and *admirar* 'admire' normally assign dative.[1]

(4) David le teme / admira a Clara.
David CL.DAT fears admires to Clara
'David fears / admires (something about) Clara.'

In this paper, we focus on two typologically different languages, namely Spanish (SVO) and Korean (SOV). We address the challenging issue of the languages' unmarked word order in association with grammatical functions, theta-roles, case and eventualities in the sentence structure, which matches the prominence relation of these features. We model psych-verbs in HPSG by means of a typed inheritance hierarchy and lexical rules (LRs). We propose a more detailed division in the psych domain for both languages,

[1]Since Spanish shows differential object marking w.r.t. full NPs, the ACC/DAT distinction is sometimes blurred (cf. Machicao y Priemer 2014 for more details). Hence, we are making the distinction more clear using clitics.

capturing the fact that not only the EXP alternates in case marking in EO structures, but also the STM alternates with respect to case in ES constructions. Furthermore, our data suggest a differentiation of theta-roles similar to Pesetsky's (1995) proposal. We assume a STM role which can be further specified as *stimulus-causer*, *subject matter* or *target*. This division correlates with the different subtypes of psych-verbs proposed and the unmarked word order.

2 Properties of psych-verbs in Spanish and Korean

Since Belleti & Rizzi's (1988) work on Italian psych predicates, these verbs have been seen as a threefold classification: (a) class I (e.g. *temere* 'fear'): a stative ES structure; (b) class II (e.g. *preoccupare* 'worry'): a stative/eventive EO construction; and class III (e.g. *piacere* 'please'): a stative EO structure where the EXP is only assigned dative case and generally appears in preverbal position. In addition, Alexiadou et al. (2004) argue that the Italian verb classes II and III are unaccusative and that the mapping of theta-roles to syntactic positions is indeed guided by UTAH (Baker, 1998). The authors claim that psych-verbs have different underlying representations, and at D-structure, the EXP is projected higher than the STM. In terms of their semantic structure, Pesetsky (1995) provides a more detailed analysis of the verbs with respect to their arguments' theta-roles, where: the subject of ES verbs is the EXP and the object is seen as a *target/subject matter*; while EO verbs have a *causer* as the subject, and thus expanding the thematic hierarchy as in (5).

(5) Causer > Experiencer > Target/Subject Matter

Based on these ideas, the next section attains to a description of the properties of basic psych-verb constructions in the target languages. Spanish and Korean present different morphological structures in terms of argument alternations and directionality: Spanish derives intransitive ES verbs from more basic transitive EO verbs (e.g. *asustar* 'frighten') by means of reflexivization (e.g. *asustarse* 'get frightened'); whereas Korean derives transitive EO items from more basic intransitive ones (e.g. *mwusepta* 'scary') by means of a periphrastic causative operation (e.g. *mwusepkey hata* 'frighten'). In this paper, we focus on the basic psych-verbs constructions (leaving aside their derivations) and their case alternation patterns, linearization, theta-roles and event structure; providing a more detailed classification of the predicates.

2.1 Spanish

Starting with the EO verb class (class II in Belleti & Rizzi's 1988 work), the alternation of the EXP between ACC and DAT is generally associated with

the eventuality of the verbs, where dative experiencers appear in stative constructions and accusative experiencers in eventive ones (cf. Arad, 1998; Marín, 2015). This distinction is clear for Spanish. For instance, sentence (2) is stative, with no change of state (CoS) in the EXP (cf. Marín, 2015). Following Pesetsky (1995), the STM bears the theta-role of the subject matter (SM): a non-agentive argument which provokes an emotional response in the EXP, but does not cause the emotion directly. The interpretation of sentence (2) is that the experiencer Clara is frightened by something about David/the report, but not the STM volitionally frightening Clara. This stative structure is associated with an unmarked OVS word order in all-focus sentences (cf. Fábregas et al., 2017; Jiménez-Fernández & Rozwadowska, 2016). On the contrary, accusative constructions, such as (3), are eventive and entail a CoS (Fábregas et al., 2017); the external argument is generally perceived as a volitional animate interpreted as a causer (CSR). As in Landau (2010), these structures are considered bi-eventive and the unmarked word order in all-focus sentences is SVO (cf. Fábregas et al., 2017).

There is data showing that there is a correlation between the DAT/ACC alternation of the EXP and the theta-role of the STM, where the SM appears in dative stative structures and the CSR in accusative eventive ones. In fact, verbs such as *gustar* (class III) that only assign DAT to their EXP are no distinct from the dative alternant of class II in that they are stative non-agentive constructions, with no CoS (cf. Landau, 2010; Reinhart, 2002), and the STM is perceived as the SM (6).

(6) [A Clara]$_{\text{DAT.EXP}}$ (le) gusta [David / el reporte]$_{\text{NOM.STM}}$.
to Clara CL.ACC likes David the report
'Clara likes David / the report.'

In order to have a clearer mapping of roles and case marking, a more detailed distinction of theta-roles needs to be made (cf. Fig. 1). Psych-verbs in their causative eventive constructions can present two different sources of emotion: (a) an *animate stimulus-causer* (e.g. *David* in (3)), who has control over the event and directly causes a psychological state in the EXP; and (b) an *inanimate stimulus-causer* (e.g. *the report* in (3)) that directly triggers the emotion in the EXP (Pesetsky, 1995).[2]

In addition, data from Spanish show that there is also an alternation of the STM in ES structures, and this alternation is related to the interpretation of the target (TG) vs. SM distinction. Traditionally, it has been said that class I stative predicates assign ACC to their objects, as in the case of *amar* 'love' in (7). However, there are lexical items in this class that are more frequently

[2]As in Alexiadou & Iordachioaia (2014), we separate the *agent* from the *causer*. We further differentiate the *stimulus* of psych predicates, which includes a *stimulus-causer*, from that of a *pure-causer* occurring in non-psych-verb constructions (e.g. *Peter broke the vase*) (see Fig. 1).

found in DAT structures such as *temer* 'fear' and *admirar* 'admire' in (4). In addition, *amar* 'love' also appears in more marked DAT sentences like (8). The same is true for *temer* 'fear' items, with a more marked ACC alternant as (9) shows.

(7) [David]$_{\text{EXP}}$ (la) ama [a Clara]$_{\text{TG}}$.
David CL.ACC loves to Clara
'David loves Clara.'

(8) [David]$_{\text{EXP}}$ le ama [las manos]$_{\text{TG.ACC}}$ [a Clara]$_{\text{SM.DAT}}$.
David CL.DAT loves the hands to Clara
'David loves (something about) Clara, her hands.'

(9) [David]$_{\text{EXP}}$ la teme [a Clara]$_{\text{SM.ACC}}$.
David CL.DAT fears to Clara
'David fears Clara.'

As pointed out before, there is a correlation between DAT structures and the SM. In (8) and (9), Clara is the SM. The interpretation that is obtained is that David (constantly) loves/fears something about Clara (there is no CoS in the EXP). The other argument (i.e. TG) corresponds to what is being loved or feared by David, which in this case is 'the hands'. Consequently, we understand the TG in lines of Seres & Espinal (2018): an individual entity, familiar to the EXP, with no abstract reference, where the emotion is targeted to. The presence of the SM in ES sentences implies that there is another argument that is not compelled to be realized in the syntax, but it is semantically implied (i.e. TG). The contrary is not possible, i.e. a TG semantically implying the existence of the SM.

The interaction of theta-roles and the distinct case marking of both EXP and STM has an impact in linearization yielding different unmarked word orders and further specifying the sub-classes proposed by Belleti & Rizzi (1988). As seen in (3), the transitive configuration of the psych-verb sentences resembles the default (canonical) linearization of verbs with an agent subject and a patient object (SUBJ$_{\text{AG-NOM}}$ > OBJ$_{\text{PAT-ACC}}$). However, (2) deviates from that configuration placing the EXP in fronting position. This word order has been attributed to the subject-like properties of the EXP able to bind an anaphoric element (cf. Reinhart, 2002; Temme & Verhoeven, 2016), to show non-canonical passivization (cf. Grimshaw, 1990; Landau, 2010), and to accept extraction from direct objects (cf. Belleti & Rizzi, 1988). As a result, EO verbs can be distinguished into two classes: (a) class 1, which subsumes verbs such as *gustar* 'like' and the DAT alternant of *asustar* 'frighten' in one group, placing the EXP in fronting position; and (b) class 2, that only contains psych-verbs in eventive structures, and hence, yielding a preferable STMCSR-NOM > EXP-ACC alignment (cf. Tab. 1). On the contrary, ES verbs always place the EXP in fronting position and the STM

as the object. Furthermore, due to their stimulus DAT/ACC alternation, this class can be divided into: (a) class 3, with a more prototypical ACC marking of the STM (e.g. *amar* 'love', *odiar* 'hate'); and (b) class 4, with a more prototypical DAT marking of the object (e.g. *temer* 'fear', *admirar* 'admire'). Table 1 summarizes the properties previously described for Spanish psych-verbs yielding a new fourfold classification.

example	type	θ-role & case		eventuality	unmarked WO	class
		STM	EXP			
gustar	EO	SM-NOM	DAT	state (−CoS)	EXP-DAT > SMNOM	1
asustar	EO	SM-NOM	DAT	state (−CoS)	EXP-DAT > SM-NOM	1
		STMCSR-NOM	ACC	event (+CoS)	STMCSR-NOM > EXP-ACC	2
amar	ES	TG-ACC	NOM	state (−CoS)	EXP-NOM > TG-ACC	3
		SM-DAT[3]	NOM	state (−CoS)	EXP-NOM > SM-DAT	4
temer	ES	TG-ACC[3]	NOM	state (−CoS)	EXP-NOM > TG-ACC	3
		SM-DAT	NOM	state (−CoS)	EXP-NOM > SM-DAT	4

Table 1: Properties of Spanish psych-verbs

2.2 Korean

In the case of Korean, ES psych-verbs participate in double nominative (NOM-NOM) stative constructions, where both the EXP and the STM are assigned nominative case (Kim & Choi, 2004). Linearization is strict in NOM-NOM sentences with the EXP preceding the STM (i.e. word order freezing effects), as in (10)[4].

(10) [Mina-ka/-nun]$_{\text{EXP}}$ [khun soli-ka / Minho-ka]$_{\text{STM}}$ mwusepta.
Mina-NOM/-TOP big noise-NOM Minho-NOM is.scary
'Mina is scared of the big noise / Minho.'

Corpus studies and elicitation tasks have shown that NOM-NOM constructions are more limited in the psych domain, and that the preferred structure is that of the EXP being assigned the topic (TOP) marker (Kim, 2008).[5] In addition, double nominative sentences are subject to participate in case marking alternation and are also considered stative (Kim, 2008). In

[3] As mentioned previously, verbs like *amar* 'love' and *temer* 'fear' show the same kind of alternation, hence belonging to classes 3 and 4. However, the former prototypically assigns ACC to its object, whereas the latter normally assigns DAT to its object. This distinction leaves the SM-DAT for *amar* 'love' and TG-ACC for *temer* 'fear' more marked, but nevertheless possible. In addition, Spanish has ES psych-verbs that only assign ACC to their objects (e.g. *compadecer* 'feel sorry for'), and those that only assign DAT (e.g. *codiciar* 'covet').

[4] We use the Yale Romanization for the examples in Korean.

[5] According to Yoon (2004), both NOM and TOP are structural case markers. We follow Yoon (2004) and treat NOM and TOP as variants of the first case assigned by the Case Principle (cf. Section 4).

terms of which argument alternates in case, Nam (2015) groups the verbs into two classes according to what she calls "causing sub-events", where: (a) agentive experiencer predicates (AEP) alternate the EXP between NOM and DAT; while (b) patientive experiencer predicates (PEP) alternate the STM between NOM and DAT.[6] We propose, however, that this alternation has to do with the event structure of the verbs and the theta-roles assigned to the STM, instead of a classification of causing sub-events.

Recent studies propose that a subclass of state has to be distinguished, namely inchoative states (Bar-el, 2005). For Korean, Choi & Demirdache (2014) and Choi (2015) claimed that there are two types of stative predicates: (a) *pure (typical) states*, which are atelic; and (b) *inchoative states*, items which entail a CoS due to a zero affixation of a BECOME operator in the lexical item. In the psych domain, this corresponds to (a) ES pure states consisting of verbs/adjectives (e.g. *mwusepta* 'scary'), and (b) ES inchoative psych-verbs comprising inherently inchoative verbs (e.g. *ccacungnata* 'get irritated'). Looking at the Korean data, the distinction between SM/TG proposed here for Spanish is also productive in this language. In a sentence like (11) with pure state verbs, the STM is perceived as a SM; i.e. Mina is scared of something about the big noise. However, in sentences like (12) with inchoative psych-verbs, the STM is considered a TG; i.e. Mina directs her emotion of being irritated towards Minho, a known entity by the experiencer.

(11) [khun soli-ka/-nun]$_{SM}$ [Mina-eykey]$_{EXP}$ mwusepta.
big noise-NOM/-TOP Mina-DAT is.scary
'(Something about) the big noise is scary to Mina.'

(12) [Mina-ka/-nun]$_{EXP}$ [Minho-eykey]$_{TG}$ ccacungnanta.
Mina-NOM/-TOP Minho-DAT gets.irritated
'Mina gets irritated at Minho.'

As in Spanish, the Korean data show that there is case marking alternation for both the EXP and STM between NOM and DAT case, but contrary to Spanish, both Korean pure states and inchoative psych-verbs do not allow for the co-occurrence of the SM and TG in the same structure (cf. (13) vs. (8), (9)).

(13) [Minho-ka]$_{SM}$ [*sengkyek-ul]$_{TG}$ [Mina-eykey]$_{EXP}$ mwusepta
Minho-NOM character-ACC Mina-DAT is.scary
'Minho his character is scary to Mina.'

In terms of linearization, again the interaction of theta-roles, case marking and event structure plays a role in the different unmarked word order

[6] According to Nam (2015), the EXP plays the role of agent in the experiential causing sub-event in AEP structures; while in PEP, the EXP plays the role of patient or theme.

alignments. In Korean, double nominative constructions present word order freezing effects. However, the alternation of one of the arguments in DAT case allows for free word order. Correlating Nam's (2015) classification of AEP with pure states and PEP with inchoative psych-verbs w.r.t. case marking alternations; we observe that Korean shows the following unmarked word order: (a) pure states prefer the EXP-DAT argument placed in object position and the SM-NOM in fronting position (cf. (11)), whereas (b) inchoative psych-verbs place the EXP-NOM in fronting position while the TG-DAT is the object in the sentence (cf. (12)). Parallel to Spanish, this leads us to have a fourfold classification of psych-verbs, as presented in Table 2.

example	type	θ role & case		eventuality	unmarked WO	class
		STM	EXP			
mwusepta	ES	SM-NOM	NOM	state (−CoS)	EXP-NOM > SM-NOM	1
	EO	SM-NOM	DAT	state (−CoS)	SM-NOM > EXP-DAT	2
ccacungnata	ES	TG-NOM	NOM	inch (+CoS)	EXP-NOM > TG-NOM	3
	ES	TG-DAT	NOM	inch (+CoS)	EXP-NOM > TG-DAT	4

Table 2: Properties of Korean psych-verbs

3 Restructuring predicates in HPSG

Similar to Koenig (1999) and Davis & Koenig (2000), we are not assuming a hierarchy based approach to theta-roles and linking along the lines of Baker (1998), Pesetsky (1995), a.o. Moreover, we are providing a constraint-based analysis of theta-roles and linking. In contrast to the classic treatments of predicates in HPSG, we are proposing two main changes that helps us to achieve a more elegant analysis: we model predications in a neo-Davidsonian style and theta-roles not as attributes, but as types.

3.1 A neo-Davidsonian treatmeant in HPSG

In HPSG, the treatment of theta-roles is typically Davidsonian (cf. Davidson, 1967), i.e. a predicate is seen as a relation between an event and its arguments. For instance, the semantics of the verb *to love* is represented as the CONT value in (14). It introduces a relation (of type *love-rel*(*ation*)) between three arguments: an event and two theta-roles. The arguments are modeled as attribute-value pairs such that ARG0 takes an event ($\boxed{1}$), and the STM and the EXP[7] take indices as values. The value of ARG0 is structure-shared with the value of IND(EX), i.e. the verb *to love* denotes an event(uality) (cf. fn. 17).

[7]In different HPSG-accounts, arguments of relations have been modeled in different ways: as very predicate-specific attributes, e.g. LOVER and LOVEE (Pollard & Sag, 1987); as non-specific attributes, e.g. ARG1 and ARG2 (Copestake et al., 2005); as proto-role-like attributes, e.g. ACTOR and UNDERGOER (Davis & Koenig, 2000).

(14)
$$\begin{bmatrix} \text{CONT} & \begin{bmatrix} \text{IND} & \boxed{1}\ \textit{event} \\ \text{RELS} & \left\langle \begin{bmatrix} \text{ARG0} & \boxed{1} \\ \text{STM} & \textit{index} \\ \text{EXP} & \textit{index} \\ \textit{love-rel} & \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

The problem of the (strict)[8] Davidsonian approach is that it does not allow for the manipulation of arguments. That is to say, we cannot simply add arguments to the relation or delete them without assuming a new predicate. For instance, the verb *to kick* in (15) realizes two syntactic arguments: *Luise*, interpreted as the agent, and *Jacob*, interpreted as the patient. In (16), the verb *to kick* could be interpreted in two different ways, cf. (16a) and (16b).

(15) Luise kicked Jacob.

(16) Luise kicks very elegantly.

a. Luise kicks some person x, x is semantically implied, but syntactically not realised.

b. Luise strikes out with her foot – without implying the existence of a target of the kick – e.g., doing martial arts.

For the interpretations intended in (15) and (16a), one single relation (cf. (17)) can be proposed. The difference between them can be modeled treating the object of *kick* as syntactically optional, but as present in the semantics of the predicate, hence semantically implied. For (16b) though, a different relation (cf. (18)) must be assumed, since (17) is defined for three arguments, and for (16b) no object is semantically implied.

(17)
$$\begin{bmatrix} \text{ARG0} & \textit{event} \\ \text{AG} & \textit{index} \\ \text{PAT} & \textit{index} \\ \textit{kick}^1\textit{-rel} & \end{bmatrix}$$

(18)
$$\begin{bmatrix} \text{ARG0} & \textit{event} \\ \text{AG} & \textit{index} \\ \textit{kick}^2\textit{-rel} & \end{bmatrix}$$

Since the verb predication in (15) and (16) is actually the same, the only interpretative difference being the (non-)implication of a patient-argument, it would be desirable to have a semantic representation that avoids the necessity of two different *kick*-relations, i.e. (17) and (18). Thus, we are proposing a neo-Davidsonian approach[9] along the lines of Parsons (1990) (cf. (19) and (20)), that allows us to manipulate the arity of predicates without having to assume different predicates (e.g. $kick^1$ and $kick^2$ in (17)

[8] Some Davidsonian analyses allow to add but not to delete arguments from a relation, see e.g. the analysis of benefactives in Müller (2018, 69).

[9] A neo-Davidsonian approach for HPSG has also been proposed in Copestake (2006) for independent reasons.

and (18)). In other words, the *kick-rel* tells us something about the kind of eventuality denoted by the predicate and the intension of the verb. The theta-roles related to the predicate are included in the RELS list as single elementary predications (EPs), linked to the main predicate via the value of the ARG1 attributes of the theta-roles.

(19)
$$\left[\text{RELS}\left\langle\left[\begin{array}{ll}\text{ARG0} & \boxed{1}\ \textit{event}\\ \textit{kick-rel} & \end{array}\right],\left[\begin{array}{ll}\text{ARG0} & \textit{index}\\ \text{ARG1} & \boxed{1}\\ \textit{agent} & \end{array}\right],\left[\begin{array}{ll}\text{ARG0} & \textit{index}\\ \text{ARG1} & \boxed{1}\\ \textit{patient} & \end{array}\right]\right\rangle\right]$$

(20) $\lambda y \lambda x \lambda e.kick(e) \wedge agent(x)(e) \wedge patient(y)(e)$

Handling theta-roles as EPs is a further change we are proposing (cf. (19) and (17)) since we model theta-roles as relations between events and individuals in the spirit of neo-Davidsonian approaches (cf. (20)). For instance, the *kick-rel* is a predication of type *event*(*uality*) and the elements interpreted as agent and patient of the predication are objects of type *index*. The *agent* and *patient* types are relations between the value of ARG0 and the value of ARG1.

3.2 Underspecification of theta-roles

In line with the previous neo-Davidsonian approach, we are analyzing theta-roles as types.[10] These types are modeled along an inheritance hierarchy for semantic relations (*sem-rels*). In this hierarchy (cf. Fig. 1),[11] theta-roles (*θ-role*) and predicates (*pred*) are subtypes of *sem-rels*. This reflects the way they are being modeled in the RELS list (cf. (19)), i.e. as conjoined EPs of the same (super-)type (i.e. *sem-rels*).

Modeling theta-roles as in Fig. 1 allows us to establish commonalities and differences among them by means of (multiple) inheritance. This classification is needed for theoretical as well as for empirical reasons. For instance, theoretically, it allows us to define psych-predicates as an eventuality involving an experiencer (*exp*) and a stimulus (*stm*), although the stimuli can be differentiated into: subject matter (*sm*), target (*tg*), and stimulus-causer (*stmcsr*). As it has been shown in (7)–(9), these different classes of stimuli are empirically needed in order to have, for instance, a more appropriate account for word order and case assignment for psych-predicates.

[10] Davis & Koenig (2000, 70–71) and Van Eynde (2015, 109–113) also treat theta-roles as types, but with a Davidsonian approach. That is, it is not the (definition of the) theta-role itself that is more specific along the inheritance hierarchy, but the Davidsonian relation, i.e. their EP gets more attribute-value pairs (representing theta-roles) along the hierarchy. In our approach, the hierarchy of type *θ-role* reflects an *ontology* of theta-roles.

[11] Figure 1 depicts by no means an exhaustive representation of theta-roles. For the time being, we are focusing only on the relevant theta-roles for psych-predicates, i.e. only on the types *experiencer* and *stimulus*.

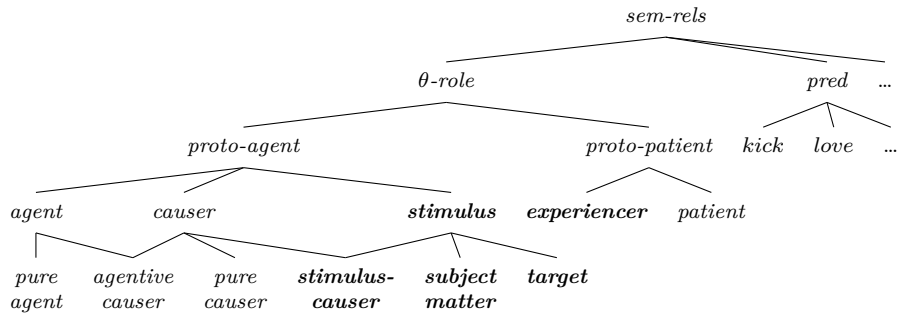

Figure 1: Type hierarchy for *semantic-relations*

Furthermore, this hierarchy allows for the modeling of generalizations of theta-roles and verb classes (e.g. psych-verbs). By means of multiple inheritance, we can account for entities that have the properties of causers as well as the properties of stimuli (e.g. *stimulus-causer*) without having to choose whether we are dealing with a causative or a psych-verb, since it could be both. Therefore, it is expected that some generalizations concerning stimuli will also affect some subset of causers, and some generalizations applying to causers will affect some subset of stimuli.

In a further state of the theory, this approach enables us to define theta-roles by means of constraints assigning semantic properties to their subtypes. This is one of the main differences between our proposal and e.g. Davis & Koenig (2000). They define theta-roles by means of (disjunctive) sets of characteristic entailments (Davis & Koenig, 2000, 72) and work mostly with proto-roles, similar to Dowty (1991). In their analysis, characteristic entailments are model-theoretic constraints, which do not belong to the descriptive language of the grammar. Therefore, "their satisfaction cannot be checked by looking at the metalanguage […] use[d] in our descriptions" (Davis & Koenig, 2000, 72–73). Characteristic entailments are thus not properly part of the (described) grammatical system, but rather of some kind of meta-grammar. Davis & Koenig's approach is mostly concerned with linking and word classes modeled through constraints in an inheritance hierarchy. We follow their approach to linking in many respects, but the empirical data in the psych domain force us to assume a different treatment of theta-roles (as specific neo-Davidsonian types) in order to achieve a more fine grained distinction of the verbs. To some extent, we take advantage of the analyses of proto-roles (Dowty, 1991), of (proto-)theta-roles as characteristic entailments, of linking as constraints in an inheritance hierarchy (Davis & Koenig, 2000; Van Eynde, 2015), and of hierarchy-based modeling of theta-roles (Baker, 1998; Belleti & Rizzi, 1988; Pesetsky, 1995).

Our analysis reflects the idea of proto-roles[12] via different levels of ab-

[12]Proto-roles are divided into proto-agent vs. proto-patient or actor vs. undergoer

straction encoded in the inheritance hierarchy. As such, a type *proto-agent* could be proposed as having e.g. *agent*, *causer*, and *stimulus* as subtypes, and being less constrained than its subtypes. As far as the empirical data suggest – i.e. some generalizations apply to this kind of (proto-)supertype – the assumption of such proto-roles is descriptively well-founded. For our current goal – the analysis of linking relations in the psych domain – and due to lack of space only two types (and their subtypes) will be considered: *stimulus* and *experiencer*.

4 Analysis of Spanish psych-verbs

As pointed out in Section 2.1, the data demand a fourfold classification for Spanish psych-verbs.[13] For the issue in question, we are assuming that the linking properties can be modeled lexically by means of an inheritance hierarchy (cf. Fig. 2) constraining the properties of different types of lexemes (cf. Manning & Sag, 1998, 124–125; Davis & Koenig, 2000, 67; Van Eynde, 2015, 115).

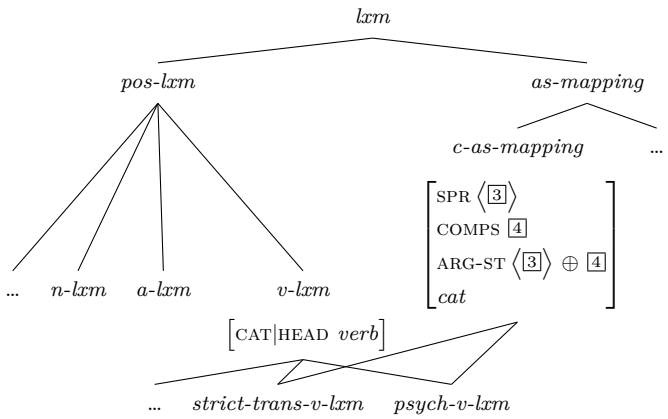

Figure 2: Type hierarchy for *lexeme*

The type *lexeme* (*lxm*) has two subtypes: *part-of-speech lexeme* (*pos-lxm*) and *argument-structure mapping* (*as-mapping*). The type *pos-lxm* constrains the HEAD value of lexemes, i.e. for *verb lexemes* (*v-lxm*) the HEAD value is of type *verb*. The *as-mapping* type[14] constrains the correspondence between

in Dowty (1991) or Davis & Koenig (2000), respectively. We are using the former denomination.

[13] Due to space issues, we cannot provide a complete theory of linking in this paper. Our main goal here is just to provide a descriptive and more adequate treatment of Spanish and Korean psych-verbs, their properties and subclasses.

[14] Our *lxm* hierarchy is similar to the one proposed in Van Eynde (2015, 115). One difference we would like to point out here is that our *as-mapping* type only resembles Van Eynde's *linking* type. We consider "linking" the relation between semantic and syn-

elements in the ARG-ST list and elements in the valence features (for Spanish: SPR and COMPS). Its subtype *canonical-as-mapping* (*c-as-mapping*) constrains the "canonical" correspondence for verbs in Spanish, thus passing its constraint (by means of multiple inheritance) to *strict-transitive verb lexeme* and – as we will see later – also to *psych-verb lexeme*.

As already mentioned, psych-verbs can be divided into two subclasses: ES and EO psych-verbs, each of which can be subdivided into two further subclasses: ES with accusative object, ES with dative object, EO with case alternation and EO without alternation (cf. Fig. 3).[15] The *psych-v-lxm* type constrains the mapping of semantic arguments to the elements in the ARG-ST list (cf. the *linking* type in Van Eynde, 2015). The elements in the ARG-ST list are normally ordered according to their prominence w.r.t. case, binding, extraction, etc. (cf. Manning & Sag, 1998, 111; Koenig, 1999, 29; Müller, 2016, 295; a.o.).

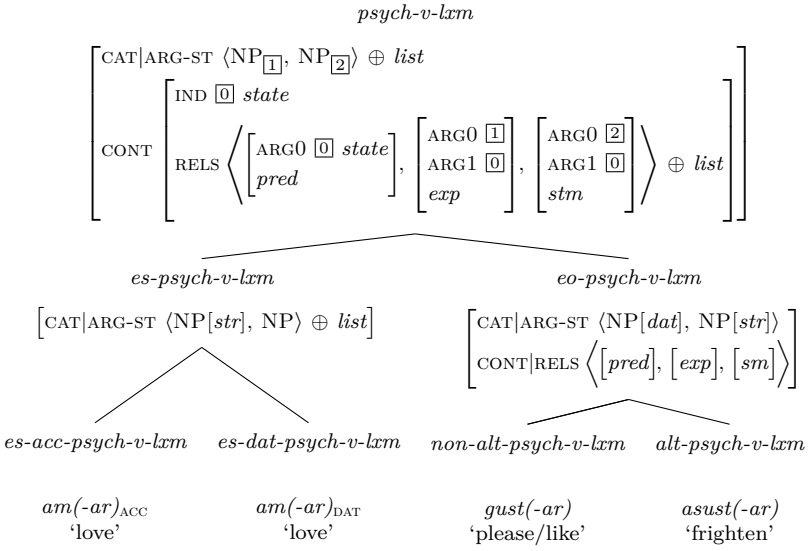

Figure 3: Type hierarchy for *psych-v-lxm* in Spanish (neo-Davidsonian)

In our analysis, the experiencer of psych-verbs is linked to the first element in the ARG-ST list, and the stimulus to the second element.[16] Further elements could be considered (cf. ⊕ *list*); however this is not required, since *list* could be further specified as being of type *empty list* (*e-list*), e.g. for objects of type *eo-psych-v-lxm*. In addition, *psych-v-lxm* constrains psych-verbs

tactic arguments of lexemes (cf. Machicao y Priemer, 2018). The constraint relating the elements of the ARG-ST list to the elements of the valence features – our *as-mapping* – is only *a part* of the whole linking concept. Furthermore, Van Eynde's *linking* type is different in that it relates the semantic arguments to the elements in the ARG-ST list.

[15] A further class will be derived by means of a lexical rule (cf. Fig. 5).

[16] Having the experiencer as the first element of the ARG-ST list reflects the psych effects of the experiencer seen as a quirky subject.

as being of eventualities of type *state*.[17] The type *es-psych-v-lxm* constrains the first element of the ARG-ST list (the experiencer) as having structural case, while *eo-psych-v-lxm* constrains the experiencer as a dative object and the stimulus as an NP bearing structural case. Moreover, *eo-psych-v-lxm* limits the ARG-ST list as having only these two arguments.

The two subtypes *es-acc-psych-v-lxm* and *es-dat-psych-v-lxm* add the further constraints needed in order to differentiate between *amar* 'to love' with accusative and dative (cf. Fig. 4).

$$\textit{es-acc-psych-v-lxm} \Rightarrow \begin{bmatrix} \textsc{cat}|\textsc{arg-st} & \langle \mathrm{NP},\ \mathrm{NP}[\textit{str}] \rangle \\ \textsc{cont}|\textsc{rels} & \left\langle \left[\textit{pred}\right], \left[\textit{exp}\right], \left[\textit{tg}\right] \right\rangle \end{bmatrix}$$

$$\textit{es-dat-psych-v-lxm} \Rightarrow \begin{bmatrix} \textsc{cat}|\textsc{arg-st} & \langle \mathrm{NP},\ \mathrm{NP}[\textit{dat}] \rangle \oplus \langle \mathrm{NP}[\textit{str}]\boxed{6} \rangle \\ \textsc{cont}|\textsc{rels} & \left\langle \begin{bmatrix} \textsc{arg0}\ \boxed{0} \\ \textit{pred} \end{bmatrix}, \left[\textit{exp}\right], \left[\textit{sm}\right] \right\rangle \oplus \left\langle \begin{bmatrix} \textsc{arg0}\ \boxed{6} \\ \textsc{arg1}\ \boxed{0} \\ \textit{tg} \end{bmatrix} \right\rangle \end{bmatrix}$$

Figure 4: Constraints for ES verbs

For ES verbs with an accusative object, the second element in the ARG-ST list gets also structural case and the theta-role of the stimulus is further specified as being a target. For ES verbs with a dative object, the second element in the ARG-ST list is specified as bearing dative and its theta-role is specified as subject matter. For NPs with structural case, case assignment follows the Case Principle (cf. Meurers, 1999, 204; Przepiórkowski, 1999, 93–94; a.o.), i.e. the first element in the ARG-ST list with structural case gets nominative, while further elements with structural case get accusative. A further important distinction between *es-acc-psych-v-lxm* and *es-dat-psych-v-lxm* is that the latter has an additional optional object (cf. (8)). This object is interpreted as a target and bears structural case, i.e. accusative.

Lexemes of type *eo-psych-v-lxm* are divided into two subtypes: a non-alternating type *non-alt-psych-v-lxm* for lexemes such as *gust*(*-ar*) 'to like' and an alternating one *alt-psych-v-lxm* for lexemes such as *asust*(*-ar*) 'to frighten'. The alternation shown in (2)–(3) can be modeled by means of the LR in Figure 5.

This LR takes stative predicates with an experiencer-dative and a subject matter-nominative as input (to be more precise: elements of type *alt-psych-v-lxm*, see also (2)).[18] The output of the LR represents an object in which the experiencer $\boxed{1}$ is realized with structural accusative, the aforementioned subject matter argument is deleted (represented in the LR-input as *nelist*),

[17] As a working hypothesis, we assume an ontology of eventualities similar as the one proposed by Bach (1986) with *state* as a subtype of *eventuality*.

[18] The distinction between *non-alt-psych-v-lxm* and *alt-psych-v-lxm* is important, since the LR takes only elements of the latter type as input, even if no other differences can be stated between these two types, yet.

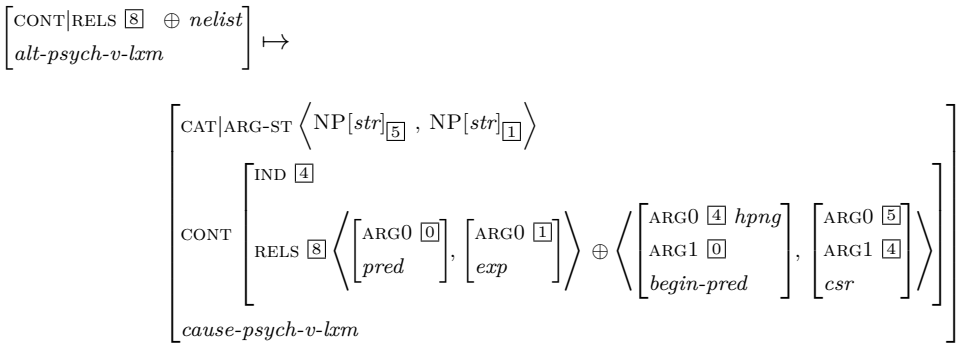

Figure 5: LR for case alternation for *alt-psych-v-lxm*

and a new semantic argument – a causer 5 – is added to the RELS list. The causer is mapped to the first element of the ARG-ST list and is realized with structural nominative (see 5). This new arrangement in the ARG-ST list has consequences for the mapping to SPR and COMPS, i.e. in the unmarked word order the experiencer is not going to precede the other arguments anymore (cf. Fig. 6), see e.g. (3). Moreover, the output of the LR is an eventuality of a different subtype; i.e. it is not a state 0 anymore – as the input of the LR – but a happening 4 (cf. fn. 17). Therefore, *cause-psych-v-lxm* is not a subtype of *psych-v-lxm* (cf. Fig. 3).

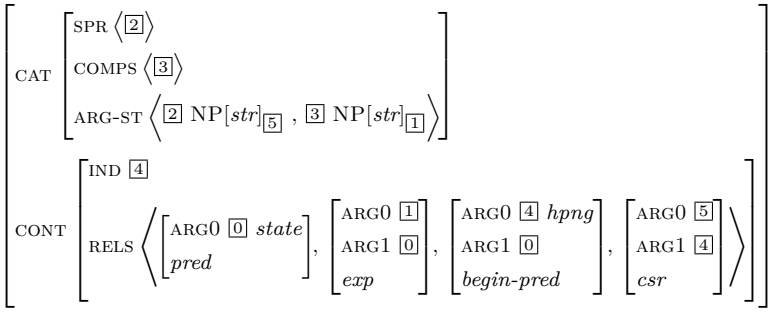

Figure 6: *asustar* with ACC

5 Analysis of Korean psych-verbs

For Korean, the inheritance hierarchy for the type *lxm* is similar to the one shown for Spanish (cf. Fig. 2), but since Korean is an SOV language (allowing scrambling), it is not necessary to assume a SPR attribute (cf. Müller, 2016, 293–295). Hence, canonically all elements in the ARG-ST list are mapped in the same order to the COMPS list of the lexeme, as shown in Figure 7.

The type *psych-v-lxm* links – as in Spanish – the experiencer with the first

$$\textit{c-as-mapping} \;\Rightarrow\; \begin{bmatrix} \textsc{comps}\ \boxed{1} \\ \textsc{arg-st}\ \boxed{1} \\ \textit{cat} \end{bmatrix}$$

Figure 7: Constraints for *c-as-mapping* for Korean

element of the ARG-ST list and the stimulus with the second one (cf. Fig. 8). Furthermore, the first element of the ARG-ST list is constrained as bearing structural case, i.e. nominative[19] qua Case Principle. Contrary to the Spanish class, Korean psych-verbs are not constrained as stative in general, since this class can be divided into stative psych-verbs (type: *state-psych-v-lxm*) and inchoative psych-verbs (type: *inch-psych-v-lxm*).

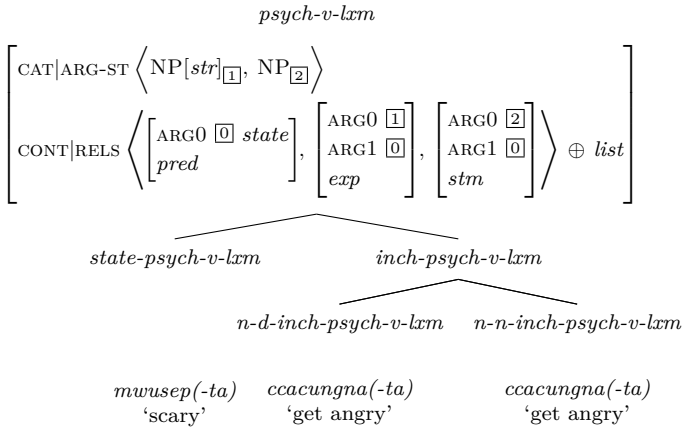

Figure 8: Type hierarchy for *psych-v-lxm* in Korean (neo-Davidsonian)

For elements of type *inch-psych-v-lxm* a further eventuality (i.e. a *begin-predication*) is introduced. This is an eventuality of type *happening* that takes the stative predication as argument (cf. value of ARG1 of *begin-pred* in Fig. 9). The IND value of *inch-psych-v-lxm* is the happening ($\boxed{5}$), not the state ($\boxed{0}$). Moreover, the stimulus argument is further specified as target (cf. (12)). In contrast, for elements of type *state-psych-v-lxm*, the theta-role of the stimulus is further specified as subject matter bearing lexical nominative, and the eventuality type of the predication is identified as a state (cf. Fig. 9).

The case alternation for lexemes of type *inch-psych-v-lxm* can be constrained by means of two types: *n-d-inch-psych-v-lxm* assigning dative to the target, and *n-n-inch-psych-v-lxm* assigning lexical nominative to it (cf. Fig. 10). The distinction between these two types concerns only case marking, neither theta-roles nor eventuality type are different.

[19]For Korean, we assume that the first element of the ARG-ST list with structural case gets nominative or topic case, being both just variants.

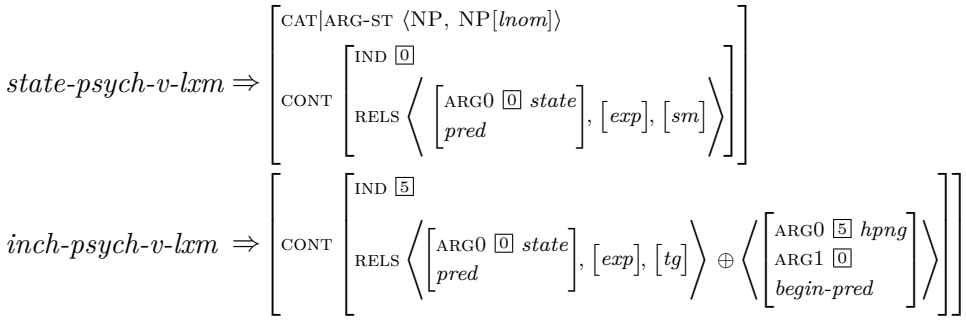

Figure 9: Constraints for stative and inchoative verbs in Korean

$$\begin{array}{lcl} \textit{n-d-inch-psych-v-lxm} & \Rightarrow & \left[\textsc{cat|arg-st}\ \langle \text{NP},\ \text{NP}[\textit{dat}]\rangle\right] \\ \textit{n-n-inch-psych-v-lxm} & \Rightarrow & \left[\textsc{cont|arg-st}\ \langle \text{NP},\ \text{NP}[\textit{lnom}]\rangle\right] \end{array}$$

Figure 10: Constraints for NOM-DAT and NOM-NOM verbs in Korean

For the alternation applying to elements of type *state-psych-v-lxm*, we need a LR (cf. Fig. 11) that makes changes in case assignment and word order, cf. (10) vs. (11). With respect to case marking, the experiencer $\boxed{1}$, which bears *str* in the input, takes dative in the output. The stimulus $\boxed{2}$, bearing *lnom* in the input, takes *str* in the output. Additionally, with respect to unmarked word order, the mapping of ARG-ST and COMPS in the output does not follow the *c-as-mapping* in Figure 7, i.e. we do not have an experiencer first structure anymore. Instead, the NP interpreted as stimulus $\boxed{6}$ precedes the NP interpreted as experiencer $\boxed{5}$.

$$\left[\begin{array}{l}\textsc{cat|arg-st}\left\langle \text{NP}_{\boxed{1}},\ \text{NP}_{\boxed{2}}\right\rangle \\ \textit{state-psych-v-lxm}\end{array}\right] \mapsto \left[\begin{array}{l}\textsc{cat}\left[\begin{array}{l}\textsc{comps}\left\langle \boxed{6},\ \boxed{5}\right\rangle \\ \textsc{arg-st}\left\langle \boxed{5}\text{NP}[\textit{dat}]_{\boxed{1}}\ ,\ \boxed{6}\text{NP}[\textit{str}]_{\boxed{2}}\right\rangle\end{array}\right] \\ \textit{n-d-state-psych-v-lxm}\end{array}\right]$$

Figure 11: LR for case alternation for *state-psych-v-lxm*

6 Conclusion

The main goal of this paper was to give a detailed description of psych-verbs in Spanish and Korean. The different lexemes that can be subsumed under the label *psych-verb* show diverging characteristics as well as commonalities. We have focused mostly on the correlations between case marking, theta-role assignment, and eventuality types in order to describe the distinct psych-verb subclasses in the languages at hand.

We have proposed a neo-Davidsonian treatment of the predications in

order to be able to account for the underspecification of theta-roles that is needed for a proper description of case alternation in Spanish, and eventuality distinction in Korean. Furthermore, the presented psych-verb hierarchies reflect a possible ontology for the psych domain based on commonalities and differences between the psych-verb subclasses. This allows us, on the one hand, to localise connections between the psych domain and other verb-classes (e.g. between *strict-trans-v-lxm* and *es-acc-psych-v-lxm* in Spanish) that could be modelled by means of multiple inheritance – something that we cannot work out here due to lack of space. On the other hand, it shows the diversity of subclasses within the psych domain and illustrates the complexity of the psych-verb class.

Certainly, some aspects of our analysis have to be worked out in more detail. For instance, more work on the inheritance hierarchy of theta-roles is needed to find out on what basis theta-roles can be constrained and which further subclasses are needed. Moreover, the assumption of an inheritance hierarchy based approach on theta-roles has further theoretical consequences for the so called *Theta-Criterion* in the generative literature. The idea that "[e]ach argument bears one and only one theta-role, and each theta-role is assigned to one and only one argument" (cf. Chomsky, 1981, 36) should be reconsidered in the light of underspecified roles.

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