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Result lexicalization with manner verbs in French: an experimental investigation of the material/product alternation and the packaging of meaning

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Abstract

French is a typical verb-framed language, in which manner verbs cannot freely combine with result-denoting constituents in a single VP. Drawing on experimentally elicited production data on Hexagonal French, this study examines how the syntactic (in)flexibility of manner-of-creation verbs influences the lexicalization of the event result. As for result lexicalization within the VP headed by the manner verb, the study explores the occurrence of effected objects and resultative PPs. Thus, it addresses the availability of the material/product alternation (*sculpter une poupée à partir du bois/sculpter le bois en (une) poupée*) as a type of argument alternation, whose existence has been questioned for the Romance languages. Furthermore, it is explored how the verbs' syntactic flexibility influences whether manner and result are lexicalized within a single VP at all or distributed onto different VPs. The results show that the material/product alternation does occur, but that only a limited set of verbs has the syntactic flexibility required for it. Additionally, it is shown that syntactic flexibility favors a denser packaging of conceptual components, since with verbs that admit an effected object, the result is realized more often in the VP than with verbs that do not.

Résumé

Le français est une langue à cadrage verbal, dans laquelle les verbes de manière ne peuvent pas se combiner librement avec des expressions résultatives dans un seul SV. L'étude présente des données de production obtenues de manière expérimentale sur le français hexagonal et analyse comment l'(in)flexibilité syntaxique des verbes qui expriment la manière de création influence la lexicalisation du résultat. Nous examinons l'occurrence d'objets effectués et de SP résultatifs. Ainsi, nous abordons également la question de la disponibilité de l'alternance matériel/produit (*sculpter une poupée à partir du bois/sculpter le bois en (une) poupée*), comme un type d'alternance argumentale, dont l'existence a été contestée pour les langues romanes. En outre, l'étude explore comment la flexibilité syntaxique des verbes influence si la manière et le résultat sont lexicalisés au sein d'un seul

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SV ou répartis entre deux SV. Les résultats montrent que l'alternance matériel/produit existe, mais que la flexibilité requise n'est présente que dans un nombre limité de verbes. De plus, il est indiqué que la flexibilité syntaxique favorise un regroupement plus dense des composants conceptuels, puisque dans les verbes qui admettent un objet effectué, le résultat est réalisé plus souvent dans le SV que dans les verbes qui ne l'admettent pas.

1. Introduction

As a typical verb-framed language in the sense of Talmy (1972, 1975, 1985, 2000), French has only limited possibilities of combining manner verbs with non-verbal result-denoting constituents within the same VP. On the one hand, French is subject to well-known structural constraints, and it is in most cases not possible to extend the event structure of a manner verb. The adjective in (1), for example, cannot be interpreted as a resultative secondary predicate, (1a), but only as a nominal modifier, cf. (1b). On the other hand, there are also lexeme-specific restrictions. For instance, the proportion of manner verbs that allow for an effected object in the sense of Fillmore (1968), that is, an object DP that denotes the product of a creation event, appears to be smaller in French than in satellite-framed languages such as English. The French verb *plier*, for example, is restricted to a change-of-state reading, but the English equivalent allows for both a change-of-state reading and a creation interpretation, cf. (2) vs. (3).

- (1) Paul a martelé le métal plat. (Burnett & Troberg, 2014: 39)
 Paul has hammered the metal flat
 a. #‘Paul hammered the metal flat.’
 b. ‘Paul hammered the flat metal.’
- (2) Marie a plié un bateau en papier.
 Marie has folded a boat in paper
 a. ‘Mary folded an existing paper boat.’
 b. #‘Marie created a boat by folding.’
- (3) Mary folded a paper boat.
 a. ‘Mary folded an existing paper boat.’
 b. ‘Mary created a paper paper boat by folding.’

The restrictions typical of verb-framed languages have been addressed in different event-structural approaches to lexicalization patterns (cf. *inter alia* Folli and Harley, 2016, 2020; Mateu, 2012; Zubizarreta and Oh, 2007 for parametric approaches; Rappaport Hovav and Levin, 1998 for a lexicalist account; Levin and Rappaport Hovav, 2019 for an overview). However, the exact conditions under which French manner verbs combine with non-verbal result expressions are not equally clear across the board, one of the possible reasons being that a significant amount of research addressing this issue has focused on motion event expression (cf. *inter alia* Aurnague & Stosic, 2019; Kopecka, 2009; Meinschaefer & Kelling, 2005; Pourcel & Kopecka, 2005; Sarda, 2019 for French). Only a few studies have so far addressed the

question of how the classification of a language as verb-framed or satellite-framed correlates with the availability of certain argument alternations within the VP (cf. Lewandowski, 2014; Mateu, 2017 for the locative alternation; Folli & Harley, 2016, 2020, for the material/product alternation). Furthermore, it is known at a general level that information density in event descriptions is typically lower in the Romance languages than in English or German (cf. e.g. Madlener-Charpentier & Liste Lamas, 2022 for information density in L2 acquisition). When a finite manner verb is involved, the result is often lexicalized in a second clause rather than being packaged into the VP headed by the manner verb, often due to event-structural constraints such as the one mentioned above, cf. (4) and (1).

- (4) Paul [a martelé_{MANNER}] le métal et [l'a aplati_{RESULT}].
 'Paul hammered the metal and flattened it.'

Despite these insights, it does not seem to be fully understood how exactly the syntactic and semantic (in-)flexibility of verbs in French – or Romance in general – affects the packaging of conceptual components into linguistic units. These observations constitute the starting point for the current study which draws on creation events as a lexical domain that has so far received only limited attention (but cf. Atkins et al., 1988 for English; Martínez-Vázquez, 1998 for Spanish in comparison to English; Mateu, 2003 for Romance in general). Creation events are interesting for at least two reasons. First, if manner of creation is encoded in the verb, there are in principle two syntactic possibilities for expressing the result or product within the same VP. The result can either be lexicalized as an effected object, as mentioned above, cf. (5), or as a resultative PP headed by *en*, cf. (6). Importantly, both types of constituents are neither freely available nor categorically barred in French. While some manner-of-creation verbs license an effected object, others do not, cf. (5) vs. (2) above. Different verbal subtypes can be distinguished in this respect (cf. Sec. 3).

- (5) Marie [a tricoté_{MANNER}] [une écharpe_{RESULT}].
 'Marie knitted a scarf.'

- (6) Marie [a pétri_{MANNER}] la pâte [en (une) boule_{RESULT}].
 Marie has kneaded the dough in (a) ball
 'Marie kneaded the dough into a ball.'

Second, the question of whether a manner verb permits an effected object, a resultative PP or both types of result-denoting constituents touches upon the question of whether French allows for the material/product alternation. With this type of argument alternation, both the material and the product (result) involved in a creation event can surface either as an object DP or a resultative PP as exemplified by English in (7).

- (7) a. Martha carved a toy out of the piece of wood.
 b. Martha carved the piece of wood into a toy. (cf. Levin, 1993: 56).

Drawing on a dictionary-based selection of manner verbs and experimentally elicited data from an oral production experiment, the current study is concerned with two main issues:¹ First, it examines the extent to which the syntactic flexibility of manner verbs affects the packaging of manner and result. Second, it investigates the conditions under which Hexagonal French allows for the material/product alternation as a type of argument alternation that involves non-verbal result expressions in combination with manner verbs.

The data will show that the verb's syntactic flexibility has a significant effect on the packaging of semantic-conceptual components. With manner verbs that allow for an effected object the result is lexicalized more often within the core VP than with verbs that do not permit an effected object. Furthermore, the analysis reveals that the material/product alternation does occur in French, but that only a subset of manner-of-creation verbs has the syntactic flexibility required for it.

The remainder of the study is structured as follows. Section 2 provides an overview over the material/product alternation (not only) in French. Section 3 identifies two subclasses of manner verbs that can express creation events in terms of their syntactic flexibility and, thus, possibilities for result lexicalization. Section 4 presents the production experiment including a qualitative and quantitative analysis of the experimental results. Section 5 provides an overall summary and discusses the findings.

2. The material/product alternation

Argument alternations have been extensively studied in the theoretically oriented literature on verbal event and argument structure (cf. e.g. Ramchand, 2013; Waltereit, 2017 for overviews). Unlike valency alternations such as the causative/inchoative alternation (cf. *inter alia* Heidinger and Huyghe, 2024; Labelle and Doron, 2010), but also compared to argument alternations affecting a single set of arguments like the locative alternation (cf. Guillet and Leclère, 1992; Kailuweit, 2008), the material/product alternation has so far received only limited attention for the Romance languages. In general, it occurs with agentive verbs and is defined by the two syntactic configurations given in (8), for an example cf. (7) above. Based on which constituent lexicalizes the result, I refer to the first alternant below as the “effected-object variant” and to the second one as the “resultative-PP variant”.

- (8) a. DP V DP_{PRODUCT} PP_{MATERIAL} “effected-object variant”
 b. DP V DP_{MATERIAL} PP_{PRODUCT} “resultative-PP variant”

In two rather recent publications by Folli and Harley (2016, 2020), it is pointed out that the material/product alternation is missing in Romance, and it is also deemed as unavailable for French in the verb lexicon Verb \exists Net (cf. Sec. 3 below for details).

¹The production experiment presented here builds on the manner verbs selected for an acceptability judgment task discussed in Schirakowski (2022), where the event structure of French creation verbs is analyzed based on Ramchand's (2008) model of the split VP. Based on a broader experimental design, this article addresses previously unexamined empirical questions concerning information density within the VP and the material/product alternation.

Folli and Harley (2016; 2020) observe that certain Italian verbs permit an effected object but cannot alternate with a variant in which the material surfaces as the direct object and the product is mapped onto a resultative PP headed by *in*, cf. (9a) vs. (9b).

- (9) a. Maria a intagliato una bambola.
 ‘Maria carved a doll.’
 b. Maria a intagliato un pezzo di legno (*in una bambola).
 Maria has carved a piece of wood in a doll
 ‘Maria carved a piece of wood into a doll.’
 (Folli and Harley, 2020: 439)

A similar statement can be found for French where it is also indicated that effected objects, but not resultative PPs are a possible means for lexicalizing the product of a creation event, cf. (10a) vs. (10b).²

- (10) a. Luc a construit une cabane (à partir) de planches.
 Luc has built a hut from planks
 ‘Luc built a hut out of planks.’
 b. *Max a construit des planches en une cabane.
 Max has built INDEF.PL planks in a hut
 ‘Max built planks into a hut.’

However, the verb *construire* used as the example in Verb \exists Net is a pure result verb that leaves manner of creation unspecified and it has been shown across languages that result verbs tend to be syntactically and semantically less flexible than manner verbs (cf. Puigdollers, Real Puigdollers 2013). This generalization fits with the observation that *build* – an English equivalent to *construire* – does not license the material/product alternation either, cf. (11), although English generally allows for it as illustrated in (7) above.

- (11) a. John built a mill out of (the) bricks.
 b. *John built the bricks into a mill. (Jezek, 2014: 41)

Jezek (2014) proposes a taxonomy of creation verbs in which she distinguishes between verbs exclusively denoting creation events (“*create-verbs*” such as *to construct*) and verbs that primarily occur in change-of-state readings but are also capable of giving rise to creation readings (“*derived creation verbs*” such as *to carve*). Crucially, it is noted that only the latter allow for the material/product alternation (Jezek 2014: 42). For French, generalizations (other than the one presented in Verb \exists Net) are still missing to my knowledge. Based on general insights on verbal elasticity, it seems worthwhile to explore the availability of the material/product alternation for verbs that cannot only denote creation, but also change of state and that specify a manner component. These are the verbs that are known to show the alternation cross-linguistically. Not relevant are thus verbs as those in (12), whose

²cf. <http://verbenet.inria.fr/class/26/> (January 30, 2024).

direct object is always an effected object. Interestingly, these are also verbs that typically do not lexicalize a manner component.

(12) *construire* ‘build’, *créer* ‘create’, *édifier* ‘build, construct’, *produire* ‘produce’

Possible candidates for the material/product alternation are rather manner verbs such as *tresser* that alternate between a change-of-state reading and a creation reading when only combined with a direct object, cf. (13a) vs. (13b). The main question arising for these verbs is whether they also license the resultative-PP variant, cf. (13c).

- (13) a. Marie a tressé les fleurs.
 ‘Mary braided the flowers.’
 b. Marie a tressé une guirlande.
 ‘Mary braided a garland.’
 c. ?Marie a tressé les fleurs en couronne.
 Marie has braided the flowers in wreath
 ‘Mary braided the flowers into a wreath.’

Manner verbs such as *rouler* that are canonically restricted to a change-of-state reading when combined with only a direct object, cf. (14a), are not expected to show the material/product alternation, cf. (14b). Canonically, they can receive a creation reading only by being combined with a resultative PP as in (14c). Verbs of this type are primarily relevant to the second research objective of this study, i.e., for answering the question of how verbal (in-)flexibility affects information density within the VP.

- (14) a. Marie a roulé la boule.
 ‘Mary rolled the ball.’
 b. ?Marie a roulé une boule {avec de la pâte/à partir de la pâte}.
 ‘Mary rolled a ball {with (the) dough/out of (the) dough}.’
 c. Marie a roulé la pâte en (une) boule.
 Marie has rolled the dough in (a) ball
 ‘Mary rolled the dough into a ball.’

3. Preliminary classification of verbs

The following dictionary-based classification is limited to verbs that fulfill the two above-mentioned criteria, that is, verbs that lexically specify a manner component and that are not restricted to creation readings. In terms of the manner component, it appears noteworthy that manner remains a controversially discussed concept (cf. *inter alia* Moline and Stosic, 2016; Stosic, 2020) and that it is a matter of debate in decompositional approaches to verbal semantics whether and, if so, on which level it is a grammatically relevant component (cf. *inter alia* Beavers and Koontz-Garboden, 2020; Levin and Rappaport Hovav, 2013; Ramchand, 2008 for different views). For the time being, I will subsume under manner verbs all creation verbs for

whom it is apparent that they – unlike the verbs in (12) above – specify in some way how the result comes into being under the creation reading. Manner can be specified rather coarse-grained as by *modeler* ‘to model, mold, shape’ or more precisely as by *tresser* ‘to braid’. Following previous studies on event decomposition, instrument verbs such as *ciseler* ‘to chisel’ or *scier* ‘to saw’ will also be taken into consideration since they have been shown to pattern with manner verbs in their syntactic behavior (cf. Wunderlich, 2012 for an overview).

The central question that needs to be clarified is whether a verb in principle allows for an effected object, a resultative PP or both types of constituents. The following presentation of data will show that this question cannot be fully answered based on dictionaries, either because the relevant information is not available or because it does not correspond to existing findings. Dictionaries typically include information on whether a verb allows for an effected object or not. However, there is often no or only very general information on whether a verb or verb class is compatible with a resultative PP. Therefore, the primary classification is based exclusively on whether the verb canonically permits an effected object. Verbs that do such as *tricoter* in (5) or *tresser* in (13b) above are labelled “flexible” verbs, cf. (15) for an exemplary list. Verbs that do not allow for an effected object like *plier* in (2) oder *rouler* in (14b) above are labelled “inflexible” verbs, cf. (16) for further examples.

(15) *forger* ‘forge’, *sculpter* ‘carve’, *tisser* ‘weave’, *tresser* ‘braid’, *tricoter* ‘knit’

(16) *lier* ‘to tie (up)’, *mélanger* ‘mix (up)’, *pétrir* ‘knead’, *plier* ‘fold’, *rouler* ‘roll (out)’

All verb classes and verbs are selected based on Verb \exists Net as a data base, which is informed by two major reference works on verbal semantics and syntax (cf. Danlos, Nakamura and Pradet, 2014; Pradet and Danlos, 2012). The basic organization of verbs into classes follows Levin’s (1993) seminal classification of verb classes and alternations in English. Information on characteristics of French, that is, syntactic configurations and event readings that are available (or not available in comparison to English) is added by Verb \exists Net and also obtained from the verb lexicon *Les verbes Français* [LVF] by Dubois and Dubois-Charlier (1997), whose classificatory system is included in Verb \exists Net.

The verb class most relevant to this study is that of “verbs of creation and transformation” (Levin-class 26, LVF-class R3), which involves five subclasses in Levin’s (1993) original systematics. In French, there are only two subclasses because the classes 26.1 (*build*-verbs), 26.3 (*prepare*-verbs) and 26.5 (*create*-verbs) have been merged into one class in Verb \exists Net. Manner verbs belonging to this group are exemplified in (17). The second subclass also attested for French corresponds to Levin’s subclass 26.5 (*knead*-verbs) and is exemplified in (18). Furthermore, there are verbs that fall into the category of verbs of creation and transformation (R3) in LVF but are considered a separate class in Levin’s classification known as “verbs of cutting”/class 21 (Levin, 1993: 156–158). This class includes manner verbs such as those in (19). Finally, there are “verbs of combining and attaching” (Levin-class 22, LVF-class U3), which can also give rise to creation events in certain syntactic configurations, cf. (19).

- (17) *bricoler* ‘fix, DIY’, *ciseler* ‘chisel’, *cuisiner* ‘cook’, *forger* [type *sculpter*]
 ‘forger’, *modeler* ‘model, mold, shape’, *mouler* ‘mold’,
sculpter ‘carve, sculpt’, *tisser* ‘weave’, *tricoter* ‘knit’
- (18) *pétrir* ‘knead’, *plier* ‘fold’, *rouler* ‘roll’ [type *plier*]
- (19) *ciseler* ‘chisel’, *râper* ‘grate, rasp’, *scier* ‘saw’ [type *scier*]
- (20) *ficeler* ‘tie (up)’, *lier* ‘tie (up)’, *mélanger* ‘mix’, *nouer* ‘tie, knot’ [type *mélanger*]

Verbs belonging to the above-named classes have in common that they primarily or at least widely occur in change-of-state readings, which are exemplified once for each verb class in (21), (22), (23) and (24).

- (21) Paul a sculpté le bois.
 ‘Paul carved the wood.’
- (22) Paul a pétri la pâte.
 ‘Paul kneaded the dough.’
- (23) Paul a scié la planche.
 ‘Paul sawed the plank.’
- (24) Paul a mélangé les œufs.
 ‘Paul mixed the eggs.’

As for the creation reading, the verbs vary in their syntactic options for expressing the result within the VP. Based on the available dictionary information, we will examine their potential for combining with an effected object (Sec. 3.1), their compatibility with a resultative PP (Sec. 3.2) and conclude with a preliminary classification and general assumptions concerning possible preferences in the packaging of semantic-conceptual components (Sec. 3.3). The section thus lays the groundwork for the experiment to be presented in Sec. 4.

3.1 Effected objects

It has been noted that effected objects are not as common with manner verbs in Romance languages, as they are in satellite-framed languages such as English (cf. Martínez-Vázquez, 1998; Mateu, 2003). The English manner verb *to bake*, for instance, can select an effected object, while there is no equivalent in French and the creation event is lexicalized without a manner component being present in the verb, cf. (25a) vs. (25b).

- (25) a. Paul baked a cake. [En.]
 b. Paul a {fait/préparé} un gâteau. [Fr.]
 ‘Paul {made/prepared} a cake.’

However, some French manner verbs, namely those of the *sculpter*-type, allow for an effected object, cf. (26), which distinguishes them from the other verb classes under consideration, all of which canonically require the object DP to be interpreted as an undergoer, cf. (27), (28) and (29).

- (26) Paul a sculpté une poupée.
 a. ‘Paul created a doll by carving.’
 b. ‘Paul carved an existing doll.’
- (27) Paul a pétri une boule en argile.
 a. #‘Paul created a ball out of clay by kneading.’
 b. ‘Paul kneaded an existing ball of clay.’
- (28) Paul a scié un triangle en bois.
 a. #‘Paul created a triangle out of wood by sawing.’
 b. ‘Paul sawed an existing wooden triangle.’
- (29) Paul a lié un bouquet de fleurs.
 a. #‘Paul created a bouquet by tying up flowers.’
 b. ‘Paul tied up an existing flower bouquet.’

3.2 Resultative PPs

The availability of resultative PPs is known to depend on the preposition that is involved as well as on verbal semantics (cf. *inter alia* Celle, 2003; Dagnac, 2009; Fong and Poulin, 1998; Lauwers et al., 2018; Métairay, 2022). Within event-structural approaches, it is often argued that resultative PPs in Romance are adjuncts rather than arguments and that they can only specify a result already lexicalized by the verb, but not introduce it (see Martin, 2023 for an up-to-date overview). While neither of these issues can be systematically addressed here, it seems important to note that the creation verbs at stake may not behave consistently in terms of combinability with a resultative PP headed by *en*. According to VerbNet, *sculpter*-type verbs cannot cooccur with a PP of this type:

“Agent V Material {into} Product” où Product est un argument effectué n’existe pas en fr. (<http://verbenet.inria.fr/class/26/>)

“Agent V Material {into} Product” where Product is an argument does not exist in French.’

In corpora, however, verbs from this subclass are widely attested with resultative PPs, cf. (30) and (31).³ These findings are consistent with results from Schirakowski (2022), in which *sculpter*-type verbs were judged as being largely acceptable with resultative PPs headed by *en*, cf. (32) (cf. Sec. 4.4.3 for possible differences between PPs that embed a bare noun and those that contain a full DP).

- (30) Ainsi agit Lady Gaga, qui sculpte ses vrais cheveux *en nœud papillon* au-dessus du crâne,
 [...]. <https://www.cosmopolitan.fr/>
 ‘So does Lady Gaga, who sculpts her real hair into a bow tie above her skull,
 [...].’
- (31) Regarde, j’ai tissé le fil *en une belle soierie* pour l’offrir à ton ami [...]. <https://www.stcharles-orleans.com/>

³All corpus examples are taken from the French Web 17 corpus (frTenTen17) (Jakubiček et al., 2013).

- ‘Look, I have woven the thread into a beautiful silk to give to your friend [...]’
 (32) Comme surprise pour sa femme, Paul a forge l’or {*en médaillon/en un médaillon*}.
 ‘As a surprise for his wife, Paul forged the gold into a medallion.’

For members of the other verb classes in question (type *plier*, *scier* and *mélanger*), a resultative PP is the only syntactic means for result lexicalization within the VP headed by the manner verb, due to the presumed unavailability of the effected-object variant. Both corpus findings and acceptability judgments confirm that verbs from these subclasses are compatible with a resultative PP headed by *en* as exemplified in (33), (34) and (35) as well as (36) and (37).⁴

- (33) Pétrissez chaque morceau *en une petite boule*. <https://www.snapulk.fr/>
 ‘Knead each piece into a small ball.’
 (34) Sciez le tasseau *en 2 morceaux de 120 cm*. <https://www.femina.fr/>
 ‘Saw the cleat into 2 pieces of 120 cm.’
 (35) La méthode tie and dye consiste à lier le tissu *en nœuds serrés*, à l’aide d’un élastique [...].
 ‘The tie and dye method consists of tying the fabric in tight knots, using an elastic band. [...]’ <https://www.guide-piscine.fr/>
 (36) Dans son atelier, Marie a pétri l’argile {*en vase/en une vase*}.
 ‘In her studio, Mary kneaded the clay into a vase.’
 (37) Comme barrière de lit, elle a roulé la couverture {*en boudin/en un boudin*}.
 ‘As a bed rail, she rolled up the blanket into a coil.’

3.3 Interim summary and general hypotheses

The data presented so far have shown in a preliminary fashion that manner-of-creation verbs differ in their ability to lexicalize the event result within the VP. Verbs of the *sculpter*-type verbs are flexible in terms of not only allowing for an undergoer object, but also for an effected object. Verbs of the other three verb classes considered here (type *plier*, *scier* and *mélanger*) do not allow the result to be lexicalized as an object DP but are canonically restricted to undergoer objects. In this sense, they qualify as inflexible verbs. Dictionary information does not fully coincide with corpus data and acceptability judgments regarding the availability of resultative PPs. It has been stated that *sculpter*-type verbs do not allow for this type of constituent, but data available so far tentatively suggest otherwise. Verbs of the *sculpter*-type can therefore be regarded as flexible in a further respect and appear to be the most likely candidates for the material/product alternation.

Additional differences between the two verb types are expected with respect to preferences in the packaging of semantic-conceptual components. The production experiment is based on the overall hypothesis that the verb’s flexibility in terms of result lexicalization influences whether the result even appears in the VP headed by the manner verb or whether manner and result are distributed onto different VPs.

⁴Verbs of cutting/the *scier*-type verbs were not part of the acceptability judgment experiment.

In the latter case, the result typically appears as the direct object in a coordinate clause or a non-finite subordinate clause, cf. (38) and (39). Crucially, with an adverbial purpose clause as in (39), the coming into being of a product/result is not implied or even implicated and the change-of-state reading takes priority over the creation reading.

- (38) Il a mélangé les fruits et en a fait une boisson.
'He mixed the fruits and made a beverage.'
- (39) Il a lié les fleurs pour en faire un bouquet.
'He tied up the flowers to make a bouquet.'

The basic assumption is thus that flexible and inflexible verbs differ in at least two respects. First, there is a difference with respect to the possible or preferred locus of the result expression within the VP (effected object and/or resultative PP) and thus the availability of the material/product alternation. Second, the verbs should also have a different impact on whether manner and result are even lexicalized within the same VP, as syntactic flexibility might contribute to a denser packaging of conceptual components.

4. The production experiment

Based on the information laid out above, the following hypotheses are tested in the experiment.

- With syntactically flexible verbs, the result component is lexicalized in the VP headed by the manner verb more frequently than with canonically inflexible verbs (H1).
- Within the class of syntactically flexible verbs,
 - the result is lexicalized most frequently as an effected object (H2a).
 - Resultative PPs also occur, and the material/product alternation can thus be attested for this subtype of manner-of-creation verb (H2b).

To identify the occurrence of different patterns of result lexicalization and their respective frequencies, an elicitation study was conducted. In this study, test subjects orally described creation events in one sentence each based on pictures and predefined verb and noun lexemes.

4.1 Material

The experimental material involved 16 critical items consisting of picture scenes each of which showed three components: 1) a person performing an action that was intended to be interpreted as a creation event, 2) an entity that can be used as the raw material for a creation event, and 3) an object that can emerge as the artifact of the event. Additionally, each picture scene included three lexemes: 1) an underlined manner verb, 2) a material-denoting noun and 3) a noun that was supposed to denote the product, cf. Figure 1 below for an example. A subset of the verbs presented in Sec. 3 was selected for the experimental material. The number of verbs

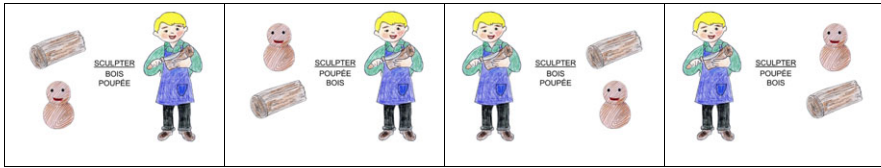


Figure 1. Example of stimulus for creation event description in four arrangements.

was restricted to 16 in order to limit the duration of the experiment. In addition, verbs whose classification seemed potentially problematic were excluded, an example being *mixer* ‘to mix (up)’ as a borrowing from English. Out of the 16 critical verbs, nine were flexible verbs of creation and transformation, cf. (40), while the remaining seven were inflexible verbs. The last group includes four inflexible verbs of creation and transformation, cf. (41a), as well as verbs of combining and attaching, cf. (41b) (cf. Sec. 7.1 in the appendix for all combinations of verbs and nouns).

(40) *bricoler* ‘fix, DIY’, *ciseler* ‘chisel’, *cuisiner* ‘cook’, *forger* ‘forge’, *modeler* ‘model, mold, shape’, *mouler* ‘mold’, *sculpter* ‘carve’, *tresser* ‘braid’, *tisser* ‘weave’

(41) a. *pétrir* ‘knead’, *plier* ‘fold’, *scier* ‘saw’, *rouler* ‘roll’
 b. *lier* ‘tie (up)’⁵, *mélanger* ‘mix (up)’, *nouer* ‘tie, knot’

It was not possible to use the same number of verbs for each subclass because the number of manner verbs that can denote creation events in one or the other syntactic configuration does not appear to be large in French. This observation is consistent with findings according to which verb-framed languages have comparatively small inventories of manner verbs (cf. Moline and Stosic, 2016: 100; for motion verbs Slobin, 2006). Manner-of-creation verbs that allow for an effected object appear to be somewhat more frequent than manner verbs that canonically achieve a creation reading only by means of a resultative PP.

4.2 Participants

The test subjects were 52 speakers of Hexagonal French. They were recruited via Prolific and compensated £ 3.50 each for their participation in the experiment which took about 20 minutes to complete.⁶ To ensure that the test subjects could be considered representative of Hexagonal varieties of French and were not multilingual in a narrower sense, several filters were used. All speakers reported that they had not lived outside France for more than six months, were born and

⁵If there were two partially synonymous manner verbs, only one of them was used in the experiment. According to one reviewer, *ficeler* would have been more idiomatic than *lier* in combination with *fleurs* and *bouquet*. Like *lier*, *ficeler* qualifies as an inflexible verb of combining and attaching (Levin-class 22, LVF class U3). The choice of the verbal lexeme should therefore not result in any significant differences in lexicalization patterns.

⁶<https://www.prolific.co/> (January 30, 2024).

raised monolingually in France, and that French was their first and primary language.

4.3 Procedure

Test subjects were presented with picture scenes such as the one shown in Figure 1 below and asked the question *Qu'est-ce que la personne a fait ?* 'What did the person do?'. They were instructed to respond in just one sentence, to use all three words presented to them and to employ the underlined verb as the "main verb" of the clause.

The experiment included 40 stimuli, 16 of which were test items and 24 were filler or training items. It followed a within-subject design, and the material was distributed onto four lists for purposes of counter-balancing. Each stimulus was presented in four different arrangements in terms of pictures and lexemes (cf. Figure 1) to prevent ordering effects from influencing lexicalization patterns. Each test subject described the same number of stimuli per possible arrangement, with each scene being viewed in only one of the four possible arrangements. Roughly the same number of test subjects described each of the four arrangements and the material was presented in a pseudo-randomized fashion.

Data was collected through the online experiment platform *Labvanced* in order to enable test subjects to create and upload audio recordings using the microphone on their own device (cf. Finger et al., 2015).⁷ Upon seeing the picture, test subjects could press a button to start the audio recording of their event description. To stop the recording, the same button had to be pressed again. Uploading the recording and proceeding to the next stimulus required another button press. Prior to the actual experiment, test subjects underwent a training phase in which they first heard a sentence describing a sample scene, and then practiced themselves by producing, recording and uploading at least three different event descriptions that were similarly structured but did not involve creation events.

Out of 832 sentences, 817 sentences were included in the analysis. Fifteen sentences were excluded due to incomplete audio recordings, or the manner verb not being used as the finite verb or not being used at all. The audio recordings were transcribed, and the utterances coded based on whether the result was lexicalized as a direct object or a resultative PP, or whether it was not lexicalized at all in the VP headed by the manner verb. In cases in which it was uncertain whether or how the result was lexicalized, the label "unclear" was assigned. During the coding process, it could only be taken into consideration whether and how all predefined lexemes were used, not whether and how all components (manner, result and material) were lexicalized. This subtle difference is due to the fact that it could not be decided beyond doubt in all cases whether the lexeme/image intended to represent the product (for instance, the doll in Figure 1 above) was really perceived as such by all test subjects (cf. Sec. 4.4.5 below for details on ambiguous findings).

⁷<https://www.labvanced.com/> (January 30, 2024).

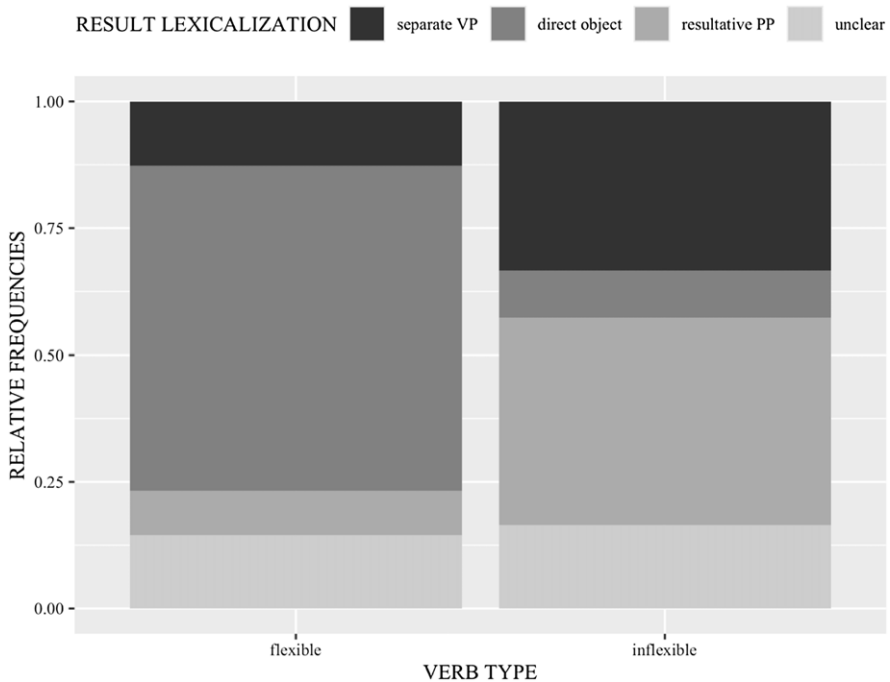


Figure 2. Result lexicalization per verb type (N = 817 [460+357]).

4.4 Results

Figure 2 provides an overview of the occurrence rates of the different ways of result lexicalization in the two verb classes under consideration. The upper parts of the bar charts represent the sentences in which the utterance contained more than one VP. The three lower parts of the bar charts show the different constellations in which all lexemes were expressed in the VP headed by the predefined manner verb.

Figure 2 shows that all lexemes occur in a single VP in the majority of cases with both types of verbs. With syntactically flexible verbs, all lexemes are expressed in a single VP in 87.39% (402/460) of the cases, with inflexible verbs the proportion lies at 66.95% (239/357). To estimate the effects of the verb type on packaging of conceptual components, a binomial mixed effects model was performed using R (4.2.3. version, R Core Team, 2023) and the package lme4 (cf. Bates et al., 2015). Type of verb (flexible vs. inflexible) and subtype (type *sculpter*, *plier* and *mélanger*) were treated as fixed factors. The model contained a by-item random intercept for items defined as the verb-noun-combination in a certain way of presentation as well as for test subjects. P-values were obtained by pairwise comparisons of a model with an effect in question against the model without this effect using ANOVAs and Bonferroni correction. Only type of verb survived as a significant predictor in the model ($\chi^2(1) = 20.56, p < 0.001$) (cf. Sec. 7.2 in the appendix for details). H1 according to which syntactic flexibility increases the likelihood for the

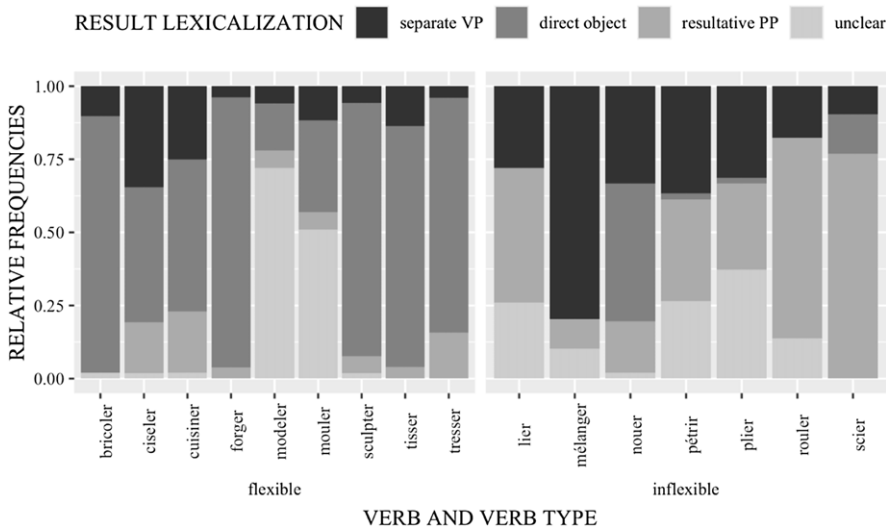


Figure 3. Result lexicalization per verb lexeme (N = 817, N for each verb [from left to right] = 59, 52, 50, 52, 50, 51, 52, 52, 51, 52, 51, 51, 49, 51, 51, 52).

occurrence of only one VP can thus be confirmed bearing in mind the restriction that in some cases it could only be decided whether all lexemes (not all conceptual components) were packaged into a single VP or not. A more detailed distinction of verbal subtypes did not improve the predictability of the model, possibly due to the limited number of lexemes in two of the three verb classes. The residual indicates a considerable variation among individual items, cf. Figure 3, which will be discussed in the following.

4.4.1 Result lexicalization in a separate VP

Viewing the segments of the bar charts from top to bottom, we first consider the cases in which the result was not encoded in the VP headed by the manner verb. Within the group of flexible verbs, a single VP was used in more than 80% of the cases with all verb lexemes but *ciseler* and *cuisiner*, cf. Figure 3 above. In all sentences involving two VPs, the material was lexicalized as the direct object of the manner verb, while the result component appeared in a non-finite adverbial clause headed by *pour* (or in a few cases *afin de*). Within the adverbial clause, the result-denoting noun was mapped onto the object position of a pure *create*-verb such as *faire* or *créer* in most cases, cf. (42). In a few cases, the verb *obtenir* was used, cf. (43).

- (42) Le sculpteur a ciselé la roche pour créer une statue. [1_13_HFr]⁸
 ‘The sculptor carved the rock to create a statue.’

⁸The sentence ID is a combination of the test subject ID, the position number of the stimulus and an abbreviation for the tested variety, here Hexagonal French [HFr].

- (43) Il a cuisiné des différents ingrédients pour obtenir un ragout. [53_36_HFr]
 ‘He cooked different ingredients to obtain a stew.’

With syntactically inflexible verbs, sentences containing two VPs do not only occur in greater numbers, but there is also more variation between the individual verb lexemes. With *mélanger*, 76.47% (39/51) of the sentences contain two VPs, cf. (44). With *scier*, this pattern is attested only in 9.61% (5/52) of the sentences, cf. (45).

- (44) L’homme a mélangé des fruits dans un mixeur afin de faire une boisson.
 [63_11_HFr]
 ‘The man mixed fruit in a blender to make a drink.’
- (45) Le garçon a scié une planche pour en faire un triangle. [25_34_HFr]
 ‘The boy sawed a plank to make a triangle.’

Across verb classes, sentences involving two VPs almost invariably involved adverbial clauses headed by *pour*. As mentioned in Sec 3.3 above, distributing manner and result in such a way ultimately means that no creation event, but a change-of-state-event (with a certain purpose) is described. For verbs such as *mélanger*, which frequently exhibit this pattern, the change-of-state reading could thus be assumed to be significantly more salient than the creation reading. Conversely, for verbs in which all components are typically packaged into one VP, the creation reading might be assumed to be at least as prominent as the change-of-state reading.

4.4.2 Result as effected object

Regarding the type of result expression within the VP, the direct object position turns out to be the preferred position for result encoding with flexible verbs. It accounts for 63.29% (291/460) of all uttered sentences, cf. (46) and (47), which confirms H2a.

- (46) La personne a tissé un tapis avec de la laine. [63_19_HFr]
 The person has woven a rug with PA-F wool
 ‘The person has woven a rug from wool.’
- (47) La fillette a bricolé un lampion avec du papier. [39_17_HFr]
 The girl-DIM has crafted a lantern with PA.M paper
 ‘The little girl has made a lantern out of paper.’

Effected objects are also attested, albeit in small numbers, with canonically inflexible verbs and account for 9.24% (33/357) of the sentences. The inspection of the data shows that the cases can be attributed to four verb lexemes, namely *nouer* (24x) and *scier* (7x) as well as one utterance each for *pétrir* and *plier*, cf. Figure 3 above. In event descriptions with *nouer*, the result is lexicalized as an effected object in 47.05% (24/51) of all cases, with *scier* it is 13.46% (7/52) of all occurrences of the verb, cf. (48) and (49).

- (48) Elle a noué le bracelet avec des fils. [25_17_HFr]
 She has knotted the bracelet with INDEF.PL threads
 ‘She knotted/wove the bracelet with yarn.’
- (49) La personne a scié un triangle à partir de la planche. [59_34_HFr]
 The person has sawed a triangle from DET plank
 ‘The person sawed a triangle from the plank.’

It is not entirely clear which factors have contributed to the occurrence of effected objects with canonically inflexible verbs. For *nouer*, LVF indicates compatibility with an effected object in figurative readings as in (50), but not for literal readings as those examined here (cf. Alexiadou, Martin & Schäfer, 2017 on literal vs. figurative readings of causative verbs and event structural differences). Due to the high proportion of effected objects, which accounts for almost half of all occurrences with *nouer*, it seems possible that this restriction is too narrow and that *nouer* can be classified as a flexible verb after all.

- (50) On noue une amitié avec un collègue. [LVF]⁹
 IMPERS ties a friendship with a colleague
 ‘A friendship is built with a colleague.’

Effected objects with *scier* are found not only in structures such as (49) above, but also in sentences in which the material-denoting noun is embedded in a PP headed by *dans*, which might allow for both a source material interpretation and a locative goal reading, cf. (51a) and (51b). Without further testing, it cannot be verified how the PP is to be interpreted and how it might contribute to the occurrence of effected objects with *scier*.

- (51) La personne a scié un triangle dans la planche. [49_15_HFr]
 The person has sawed a triangle in the plank
 a. ‘The person sawed a triangle from the plank.’
 b. ?‘The person sawed a triangle into the plank.’

Both *pétrir* and *plier* occur once each with an effected object that can be interpreted as such, because the material is lexicalized in an instrumental PP-adjunct headed by *avec*, cf. (52) and (53). Both utterances can be attributed to the same test subject.

- (52) La femme a pétri une boule avec la pâte. [53_3_HFr]
 ‘The woman kneaded a ball with the dough.’
- (53) Le garçon a plié un bateau avec le papier. [53_6_HFr]
 ‘The boy folded a boat with the paper.’

⁹Examples from LVF are taken from the electronic version, which is available in JSON- and XML-format at <http://rali.iro.umontreal.ca/rali/?q=fr/versions-informatisees-lvf-dem> (January 29, 2024).

Regarding the compatibility with effected objects, the findings of the production experiment thus coincide mostly, but not completely with the dictionary data on which the initial classification of manner-of-creation verbs was based. The fact that canonically inflexible verbs have been attested with an effected object in certain cases is not surprising insofar as effected objects are not generally blocked in French. It seems possible that lexeme-specific constraints can be overridden more easily in supportive contexts (at least by some speakers) than general structural constraints.

4.4.3 Result as PP

The scope of this section is limited to unambiguously resultative PPs headed by *en*. For the sake of completeness, it should be mentioned that there were also a few sentences in which the material was mapped onto the object position, but the PP was not resultative or not unambiguously so. An example of this in (54), where the PP adjunct headed by *pour* expresses purpose, just like the adjunct clause in (43) above.

- (54) La personne a cuisiné les ingrédients pour un ragout. [58_36_HFr]
 ‘The person has cooked the ingredients for a ragout.’

Resultative PPs headed by *en* are the most frequent means for lexicalizing the result within the VP headed by an inflexible verb and make up a total of 40.61% (145/357) of result lexicalizations with this verb type, cf. Figure 2 above. Variation can be observed in the internal structure of the PP, with structures of the type “*en* (or rarely *sous*) *forme de* + bare noun” or “*en* + bare noun” occurring most frequently, cf. (55) and (56). Resultative PPs that embed a full referential DP as in (57) account for only 15.17 % (22/145) of resultative PPs with inflexible verbs.

- (55) La personne a pétri sa pâte *en boule*. [50_4_HFr]
 The person has kneaded POSS dough in ball
 ‘The person kneaded his/her dough into a ball.’

- (56) La personne a pétri la pâte *en forme de boule*. [3_39_HFr]
 The person has kneaded the dough in form of ball
 ‘The person kneaded the dough into the shape of a ball.’

- (57) Une femme a pétri la pâte *en une boule*. [45_11_HFr]
 A woman has kneaded the dough in a ball
 ‘A woman kneaded the dough into a ball.’

With flexible verbs, resultative PPs make up only 9.13% and, thus, a significantly smaller proportion of result lexicalizations overall. However, all verbs but *bricoler* are attested with a material-denoting direct object and a resultative PP headed by *en* in a number of cases, cf. Figure 3 above. The proportion of PPs embedding a full referential DP as in (58) and (59) accounts for 33.33% (14/42) of all resultative PPs with flexible verbs and is, thus, higher than in the case of inflexible verbs. This outcome corroborates findings from Schirakowski (2022), which suggest that

flexible verbs, that is, those permitting a result-denoting object DP, also more easily support a resultative PP embedding a full referential DP.

(58) Un enfant a moulé l'argile *en un vase*. [45_19_HFr]
 A child has shaped the clay in a vase
 'A child shaped the clay into a vase.'

(59) La femme a tissé la laine *en un tapis*. [43_23_HFr]
 The woman has woven the wool in a rug
 'The woman wove the wool into a rug.'

4.4.4. The material/product alternation

Taking flexible and inflexible verbs into consideration shows that nine out of 16 verbs are attested with both the effected-object variant and the resultative-PP variant. The elicited data thus provide evidence that the material/product alternation does occur and that, in particular verbs, that license an effected object are also compatible with a resultative PP, cf. (60), (61) and (62). This finding confirms hypothesis 2b, except for the above-mentioned verbs *bricoler* and *ciseler*, which license an effected object but have not been attested with a resultative PP.

(60) a. La personne a forgé un anneau à partir d'or. [53_25_HFr]
 'The person forged a ring out of gold.'
 b. La personne a forgé de l'or *en anneau*. [4_34_HFr]
 The person has forged PA-M gold in ring
 'The person forged gold into a ring.'

(61) a. La personne a sculpté une poupée avec du bois. [1_27_HFr]
 'The person carved a doll with wood.'
 b. L'homme a sculpté du bois *en une poupée*. [45_4_HFr]
 The man has carved PA.M wood in a doll
 'The man carved wood into a doll.'

(62) a. Une jeune fille a tressé une couronne de fleurs. [54_4_HFr]
 (i) 'A young girl braided a wreath (out) of flowers.'
 (ii) 'A young girl braided a flower wreath.'
 b. La dame a tressé des fleurs *en une couronne*. [2_38_HFr]
 The lady has braided INDEF.PL flowers in a wreath
 'The woman braided flowers into a wreath.'

Analogously to the material/product alternation in English, the preposition heading the material-denoting PP in the effected-object variant can be *à partir de* 'from' or *avec* 'with', cf. (60a) and (61a). In some cases, the PP is headed by *de*, resulting in two possible interpretations of the material-denoting PP either as a separate constituent in the VP or as a modifier within the result-denoting DP, cf. (62a) (i) vs. (ii). Despite the variation in prepositions that introduce the material-denoting PP,

both the effected-object variant and the resultative-PP variant can be unambiguously identified in the a- and b-versions respectively.

4.4.5 Ambiguous findings

Finally, there are a considerable number of sentences in which only one VP occurs, and it must be considered unclear whether the result is lexicalized at all as indicated by the bottom parts of Figure 2 and 3 above. The ambiguity arises from the interaction of verbal semantics and the noun that appears in the direct object position. In sentences such as (63), the direct object can only be interpreted as an effected object, as it does not seem possible to braid an already existing wreath. With other verb-noun combinations, however, both a creation and a change-of-state interpretation are, in principle, available as exemplified in (64).

(63) La personne a tressé une couronne de fleurs. [35_40_HFr]
 ‘The person braided a wreath of flowers.’

(64) Elle a modelé un buste en plâtre. [29_8_HFr]
 a. ‘She created a bust by modelling plaster.’
 b. ‘She modelled an existing plaster bust.’

Although the experimental stimuli were designed to elicit a creation event interpretation, it remains uncertain on which interpretation subjects based their utterance. It is also not entirely clear whether they even chose between describing a change-of-state or a creation event since the statements may also have been underspecified. Consequently, sentences like the one in (64) were labeled unclear. This methodological issue shows how verbal polysemy complicates production experiments that aim at eliciting only one of the event readings licensed by a particular verb. A possible solution could be adding further questions or a paraphrasing task after each stimulus for disambiguation. While priming the subjects would have to be avoided with the first option, the second variant would considerably extend the duration of the study. It seems worthwhile to resolve this issue in future research to better understand whether or under which conditions canonically inflexible verbs also cooccur with effected objects, and to which extent verbal dictionaries reflect the verbs’ actual flexibility.

5. Summary and discussion

Drawing on an experimental approach, this study has investigated how syntactic properties of manner-of-creation verbs affect result lexicalization. Starting from the distinction between flexible verbs that select an effected object canonically and inflexible verbs that do not it was shown that syntactic flexibility favors a denser packing of conceptual components (H1). For the verbs classified as flexible, the hypotheses were confirmed insofar as effected objects were the most frequent syntactic means of result lexicalization (H2a), but almost all verbs were also attested with a resultative PP headed by *en* (H2b). The occurrence of resultative PPs is remarkable in showing that a number of manner verbs participate in the material/

product alternation, whose occurrence has been questioned not only for French, but for the Romance languages in general. The production experiment presented here made it possible to verify its occurrence for several manner verbs that qualify as derived creation verbs in Jezek's (2014) sense. The fact that French admits the material/product alternation with at least some verbs, while Italian seems to exclude it in general, suggests that the (un-)availability cannot be based solely on the distinction between verb-framed and satellite-framed languages and that intratypological differences may concern verbal and/or prepositional semantics.¹⁰ The question of whether or how the (non-)availability of certain argument alternations correlates with Talmy's typology should be investigated based on further Romance languages and argument alternations involving a resultative XP in at least one of their alternants.

The question of whether the resultative-PP variant is an exception to the restrictions usually considered constitutive for verb-framed languages requires further clarification. It touches upon Levin's and Rappaport Hovav's hypothesis of manner/result complementarity, according to which a verb root can only lexicalize manner *or* result in a given syntactic configuration, but not both components at the same time (cf. Levin & Rappaport Hovav 1991, 2010, 2013; for a syntactic approach to the idea Folli and Harley, 2020; for counter-arguments Goldberg, 2010; Rapoport, 2012). Thus, the question arises as to whether the verbs discussed here lexicalize not only a manner component, but also a result component and whether the PP in the resultative-PP variant corresponds to a "weak" or a "strong" resultative in Washio's (1997) sense. If the verb itself entails a result state, the PP would only specify the result and qualify as a weak resultative. If the verb itself does not lexically specify a result, the PP would have to be considered a strong resultative construction that introduces a result into the event structure. Taking this question seriously requires the application of tests as those discussed by Beavers and Koontz-Garboden (2012; 2020). In terms of truth conditional diagnostics, the authors have suggested that it should not be possible to deny that a change has taken place if the verb itself lexicalizes a result component. The verbs under discussion cannot be subjected to systematic testing at this point, but it seems that many of them do not readily allow a result denial as illustrated by (65).

- (65) Le sculpteur a ciselé la roche, {#mais il n'a pas du tout changé/#mais sans résultat}.
 'The sculptor carved the rock, {#but it hasn't changed at all/#but to no result}.'

If the relevant tests were to show that the verbs themselves lexicalize a result component, two conclusions could be drawn. First, derived creation verbs would call the idea of manner/result complementarity into question. Second, the resultative-PP variant of the material/product alternation would merely constitute a weak resultative and thus not qualify as an instantiation of satellite-framing.

Additionally, it remains to be shown how the PPs in the resultative-PP variant behave when subjected to argumenthood diagnostics (cf. Bonami, 1999 for French; Toivonen, 2021; Van Luven & Toivonen, 2024 for up-to-date overviews). This seems of particular interest in view of the claim that verb-framed languages allow

¹⁰I am indebted to one of the reviewers for comments on this issue.

non-verbal result expressions that are adjuncts, but not those that are arguments (see Arrizabalaga 2014; Bigolin & Ausensi, 2021 for a discussion of resultative PPs in Spanish headed by *hasta* ‘until’).

The effected-object variant appears to be interesting for two reasons. For one thing, the absence of effected objects in certain cases must be attributed to a purely lexeme-dependent constraint. Possibly, the material/product alternation is sometimes perceived as being unavailable due to the limited number of French manner verbs that allow for an effected object, and combinability with an effected object is, of course, a prerequisite for the occurrence of the alternation. For another, the non-availability of an effected object not only means that the material/production is barred, but also that there is an increased probability for the result to be lexicalized outside the VP headed by the manner verb. The verb’s selectional restrictions thus also influence more general preferences in the distribution of conceptual components and have an impact on information density within the VP.

Data availability statement. The data on which this study is based can be accessed here: <https://osf.io/n3vrt/>

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7. Appendix

7.1 Experimental material

Table 1. Stimuli – verb and noun lexemes

Manner verb	Noun denoting the material	Noun denoting the product
<i>sculpter</i> ‘carve’	<i>bois</i> ‘wood’	<i>poupée</i> ‘doll’
<i>forger</i> ‘forge’	<i>or</i> ‘gold’	<i>anneau</i> ‘ring’
<i>tresser</i> ‘braid’	<i>fleurs</i> ‘flowers’	<i>couronne</i> ‘wreath’
<i>bricoler</i> ‘craft’	<i>papier</i> ‘paper’	<i>lampion</i> ‘lantern’
<i>modeler</i> ‘model, shape’	<i>plâtre</i> ‘plaster’	<i>buste</i> ‘bust’
<i>tisser</i> ‘weave’	<i>laine</i> ‘wool’	<i>tapis</i> ‘rug’
<i>ciseler</i> ‘chisel’	<i>roche</i> ‘rock’	<i>statue</i> ‘statue’
<i>mouler</i> ‘mold’	<i>argile</i> ‘clay’	<i>vase</i> ‘vase’
<i>plier</i> ‘fold’	<i>papier</i> ‘paper’	<i>bateau</i> ‘boat’
<i>rouler</i> ‘roll’	<i>pâte</i> ‘dough’	<i>boudin</i> ‘sausage’
<i>mélanger</i> ‘mix’	<i>fruits</i> ‘fruit’	<i>boisson</i> ‘beverage’
<i>cuisiner</i> ‘cook’	<i>ingrédients</i> ‘ingredients’	<i>ragout</i> ‘stew’
<i>lier</i> ‘tie (up)’	<i>fleurs</i> ‘flowers’	<i>triangle</i> ‘triangle’
<i>pétrir</i> ‘knead’	<i>pâte</i> ‘dough’	<i>boule</i> ‘ball’
<i>nouer</i> ‘knot’	<i>fil</i> ‘yarn’	<i>bracelet</i> ‘bracelet’

7.2 Results of the statistical analysis

Table 2. Model comparison

	AIC	BIC	χ^2	df	p
Null model	669.88	683.87			
Final model	651.31	669.97	20.565	1	5.765e-06

Table 3. Summary of the final model

Fixed effect	Estimate	SE	z-score
(Intercept)	3.163	0.4237	7.465
Verb_type	-1.9592	0.4289	-4.568
Random effects	Variance	SD	
Stimulus	1.689	1.300	
Subject	2.739	1.655	

R syntax of the final model: `final_model = glmer (all_comp_in_one_VP_num ~ verb_type + (1|Subject_ID) + (1|trial_laD), data= Exp, family = binomial).`

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