The phonetics and phonology of the TİD (Turkish Sign Language) bimanual alphabet

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1. Introduction

This paper focuses on the TİD bimanual alphabet in terms of the tension between sign phonetics and phonology. The letters in the TİD bimanual alphabet are based on the visual appearance of the printed letters in the Turkish alphabet. They differ from one-handed fingerspelling systems (e.g., ASL) and even from other two-handed fingerspelling systems (e.g., BSL). TİD letter signs may differ phonologically from TİD handshapes. We will show that they do not necessarily conform to the phonological constraints of TİD. In addition, we investigate how these strongly iconic letters are borrowed into the TİD vocabulary (as in ASL, cf. Brentari and Padden, 2001), and whether these newly formed signs, i.e. initialized and fingerspelled signs, conform to the phonological constraints of TİD.

There are three main findings: (i) one-handed TİD letters are signed with the dominant hand when they are involved in signs as part of the TİD lexicon while otherwise one-handed TİD letters are fingerspelled with the nondominant hand, (ii) the handshape of a TİD sign can slightly differ from the handshape of the respective TİD letter (as in the case of the letter P) in order to conform to phonological well-formedness constraints on TİD lexical signs, (iii) a movement can be added to both uni- and bimanual letters to form an initialized sign.

The paper is organized into four parts: after briefly introducing the classification of two-handed signs in the remaining part of section 1, we will present the reader with the TİD alphabet and discuss to what extent it meets phonological constraints on the use of one and two hands (section 2). In section 3, we will discuss processes by which TİD letters enter the TİD lexicon, what linguistic challenges arise through this integration and how they are resolved (see Kubus, 2008). In section 4, we summarize our main findings and draw some general conclusions about the relation between sign language phonetics and phonology.
1.1 Two-handed signs

In order to answer our first research question whether the TİD bimanual alphabet is to be described phonetically or phonologically, we will test whether it conforms to phonological well-formedness conditions for two-handed signs. Therefore, we first introduce Battison’s (1978) well-known classification of two-handed signs and secondly the phonological constraints that govern them. There are three types of signs in terms of handedness: one-handed signs, two-handed signs, and compounds consisting of one one-handed and one two-handed sign (Johnston and Schembri, 2007). Two-handed signs vary in terms of hand dominance and the handshapes of the two hands (Battison, 1978)⁴:

(i) Type 1: Both hands have the same handshape, the same movement and generally either the same location or a symmetric location (FESTİVAL ‘festival’, see Figure 1a).

(ii) Type 2: While both hands have the same handshape one hand is dominant and the other is non-dominant (DÜĞÜN ‘wedding’, see Figure 1b).

(iii) Type 3: the hands have different handshapes, one is dominant and one is non-dominant (TAVUK ‘chicken’, see Figure 1c). In these signs, the non-dominant hand acts as articulator and its handshape must be taken from the set of unmarked handshapes.

Figure 1. (a) Type 1: FESTİVAL ‘festival’ (b) Type 2: DÜĞÜN ‘wedding’, (c) Type 3: TAVUK ‘chicken’
1.2 Phonological constraints on two-handed signs

Sandler (2006) summarizes the phonological constraints on the dominant and especially on the non-dominant hand in two-handed signs:

(i) **The Dominance Condition and the Symmetry Condition** (see 1.1, Battison, 1978).

(ii) **The Selected Finger Constraint** (Mandel, 1981, as cited in Sandler, 2006, 1885) requires a maximum of one specification for selected fingers on the dominant hand in a sign.

(iii) **Prosodic constituency/Monosyllabicity**: Most signs have only one movement and are monosyllabic (Coulter, 1982; Sandler, 1993 as cited in Sandler, 2006).

In addition, Brentari (1998, 46) defines a

(iv) **Contact** parameter for two-handed signs of type 3: the dominant hand may only contact the non-dominant hand at eight specified places.

1.3 Linguistic properties of letter names in an inter- and cross-modal perspective

Letter names, i.e., the pronunciation of a language’s graphemes in isolation, are a special class of units. By their very nature, they are no proper words or names but the constituents of the latter. The relation between letters (or, more precisely, the sounds from which they derive) and words is that of “duality of patterning” (Hockett, 1960; van der Hulst and Mills, 1996). This means that infinitely many words can be generated from a finite set of elements, the phonemes or, in our context, graphemes. Graphemes make up what we call an “alphabet”. This word already hints at one strategy of how to name graphemes: in the Greek alphabet, each letter has a proper (though irrelevant) name that starts with that letter, i.e., “a=alpha”, “b=beta”, etc.? The word “alphabet” just denotes the beginning of that list. Another, more widespread and simple strategy, is to use the graphemes themselves as names. This strategy, however, runs into difficulties exactly because graphemes are not words and therefore do not adhere to phonological well-formedness constraints on words. In particular consonants inevitably miss the minimal prosodic requirements necessary to form a phonologically licit smallest unit of a language: “n” or “t”, for example are not possible words. In order to satisfy the constraints on a minimal prosodic word for consonantal letters, an epenthetic vowel is inserted, either before or after the consonant. Thus, “n” becomes [en] and “t” becomes [ti:], in English – whose homonym ‘tea’ is a proper English word.
In spoken Turkish, the same strategy is used; however, the epenthetic vowel may differ in terms of type and position. Thus, in Turkish, “n” is [ne] and “t” is [te]. Sequences of letter names that become proper words are called “acronyms”, as, for example, ‘AIDS’, or ‘NATO’. Acronymy is a quite productive process of word formation in spoken languages.

The sign languages of the world also differ with respect to their manual alphabets, as will be discussed in the following section 2, with TİD as our reference language. Again, the challenge that letter names pose to sign languages is common to all of them as well as to spoken languages and has led to common strategies to overcome it, one of which is movement epenthesis. Letters and their names thus constitute a particularly interesting data class for exploring the interface between phonetics and phonology in signed languages in general and TİD in particular.

2. The TİD manual alphabet

TİD has a bimanual alphabet like British Sign Language (BSL), but different from it as well as different from the unimanual alphabets of e.g., American Sign Language (ASL), French Sign Language (Langue des signes française, LSF), or German Sign Language (Deutsche Gebärdensprache, DGS). Historically, the TİD manual alphabet had been preceded by a unimanual alphabet based on the LSF one. This alphabet was used at Yıldız School for the Deaf in Istanbul that was run by an Austrian educator, Ferdi Garati, from 1889-1926 (Haydar, 1925; Busse, 1994; as mentioned in Miles 2009, Betten, 2009, and Taşçı, 2011). In the 1940s, the school moved to Fatih and was renamed Fatih School for the Deaf (Özyürek, İlkbaşaran and Arık, 2005). Note that after the foundation of the Turkish Republic in 1923, in the course of Atatürk’s language reform, the old Arabic script had been replaced by the Latin script. Due to this change, the deaf manual alphabet was in need of revision, too. Therefore, probably in the 1940’s or 1950’s, the present form of the TİD manual alphabet was introduced at Fatih School for the Deaf and other Turkish deaf education institutions (Zeshan, 2003, 46).

The TİD manual alphabet is “dactylogical,” that is, based on the fingers (gr.-lat. “daktylus”) which imitate the form of the Latin block letters (Sutton-Spence, 2006, 469). Overall, the TİD manual alphabet has 29 manual letter signs which are visually modeled from the Turkish alphabet (see Figure 2). In the TİD manual alphabet, the letters J and Y have a “tracing movement” similar to the movement in the ASL letters J and Z, however, performed on the non-dominant hand and not in the air. The dot on the “i” (İ), Umlauts
(Ö and Ü), and cedillas (Ç and Ş) in TİD are produced with finger snapping which may be considered as hand-internal movements. Other than these, only Ğ (soft G) has a further hand-internal movement, namely, moving the thumb of the dominant hand up and down repeatedly (wagging). Note that in contrast to unimanual alphabets like ASL in bimanual alphabets like TİD the single letters are relatively large and there are big differences in the single handshapes. They are typically signed in the waist region where interlocutors may still perceive them quite well with peripheral vision (Sutton-Spence, 2006, 469). One-handed manual alphabets mainly overlap with the handshape inventory of the sign language, whereas two-handed alphabets only overlap with their handshape inventory to the extent that the alphabet also has one-handed letter signs (Sutton-Spence, 2006). Some letters in TİD (C, I, L, O, (P), U, V) are one-handed, indeed, and at the same time also handshapes in TİD.

![The TİD Manual Alphabet](image)

*Figure 2. The TİD Manual Alphabet (see also the videos for each letter in the appendix) (all pictures are taken from the viewer’s perspective)*
In general, we observe five kinds of fingerspelled letters in the TİD manual alphabet:
(i) **1-handed letters (static):** C, I, L, O, P, U, V
(ii) **two-handed letters, type 1 (symmetric, both hands static):** B, M, (W, X)
(iii) **two-handed letters, type 2 (same handshape, both hands static):** G, S, T, K-
(iv) **two-handed letters, type 3a (different handshape, both hands static):** A, D, E, F, H, N, R, Z, K-A, (Q)
(v) **two-handed letters, type 3b:** letters that are originally one- or two-handed and that receive a movement of some sort through the dominant hand, e.g., a tracing movement (J, Y), a secondary hand-internal movement, or a finger snapping. Originally one-handed letters that thus become two-handed are İ, Ç, Ü, Ö, J, Y; originally two-handed letters are Ğ and Ş.

All types of 2-handed signs, namely Battison’s type 1, 2, and 3 are present in the TİD manual alphabet. In our classification, type 3a signs are most frequent. However, they are all static. Only type 3b letters have a movement of some kind.

2.1 Do TİD manual letters violate phonological well-formedness conditions?

In the following, we are testing whether one- and two-handed TİD fingerspelled letters may violate various phonological constraints: hand dominance (2.1.1), contact (2.1.2), and prosodic constituency (2.1.3).

2.1.1 **Hand dominance**

One-handed TİD letters (C, I, L, O, P and V) are produced with the non-dominant hand. This is quite surprising given that one-handed TİD signs are always signed with the dominant hand and the dominant hand is readily available for signing one-handed TİD letters. So why should they nevertheless be signed with the non-dominant hand? This may be due to the fact that during the course of fingerspelling it would be hard to change the dominance back and forth between the dominant and the non-dominant hand when fingerspelling one-handed and two-handed letters. We suppose that fingerspelling one-handed TİD letters with the non-dominant hand reflects a generalization...
across the TİD manual alphabet, owing to the fact that it comprises one- and two-handed letters. Note that in one-handed letters that have two-handed variants with diacritics (cedilla) or one or two dots, as in C/Ç, Ī, O/Ö, and U/Ü, the base letter must be signed with the passive non-dominant hand and the active dominant hand adds the cedilla and the dots by finger-snapping, respectively. In those minimal pairs, changing the dominance for the base letter from dominant (as in C, I, O, U) to non-dominant (as in Ç, Ī, Ö, Ü) would result in an inconsistency within the pair. This generalization also requires one-handed letters with no two-handed counterparts to be signed with the non-dominant hand, in the first place. As a result, all TİD signs are signed with the non-dominant hand which produces the entire letter (as in one-handed letter signs) or it provides the static base of the letter to which the dominant hand actively adds the remaining part of the letter by making contact with, adding a finger-snapping, or a tracing movement to the sign (as in two-handed letter signs).

It should be noted, however, that the dominance condition and the prosodic condition interact in a highly lawful way: If there is a movement in the letter, it is always carried out with the dominant hand, never with the non-dominant one. Also, “transitional” movements, by which the dominant hand adds its part of the letter to the non-dominant hand, as in static two-handed letters (type 3a), may count as movements in this respect. This regular behavior of the dominant hand shows that movement constitutes dominance (as opposed to a static posture of the hand), in a very basic physical sense. The linguistic system can then exploit this basic regularity, and may further refine it, in terms of phonological rules that hold for a particular sign language.

For two-handed letters of Battison’s (1978) type-3, the dominance condition is violated insofar as the handshapes of the non-dominant hand do not only come from the set of unmarked handshapes permissible in TİD shown in Figure 3 (see Kubus, 2008):

![Figure 3. The narrow set of unmarked handshapes in TİD (Kubus, 2008)](image-url)
In A, K, M, N, and Y, the V-handshape is used on the non-dominant hand; in F and J the L-handshape is used, and R has a TİD P-handshape on the non-dominant hand. Lastly, H does not conform to any handshape at all.

2.1.2 Contact

The dominant hand may generally contact the non-dominant hand at any contact point in order to convey the iconic shape of the corresponding written letter. In two-handed TİD signs, as in other sign languages, the two hands can make contact with each other only at specific contact points which are phonologically constrained (Brentari, 1998; Sandler and Lillo-Martin, 2006). In two-handed TİD letters, however, the two hands may contact each other at phonologically licensed as well as unlicensed locations. Mostly, they adhere to phonologically licensed contact points, which are the following three:

(i) **Finger tip**: D, E, F, K-A, K-I, M, N, (R), S, T, Z, Q, W
(ii) **Middle knuckle**: A, H, (R)
(iii) **Base knuckle of index finger**: D, E, F, K-A, K-İ, Z

However, there are also letters that show odd contact points, such as H, R, B, Y, and X (see Figure 2). In H, the index finger of the dominant hand crosses horizontally over the vertically extended index and pinky finger. The index finger of the non-dominant hand is thereby contacted at the middle knuckle, the pinky finger, however, at a point between the middle and the upper knuckle. One could argue that there is only one contact point per letter and the proper one is the one for the middle knuckle. However, the fact that there are various contact points is an oddity already, which re-occurs in the letter R. Here, three fingers make contact at one point, namely the fingernail of the index finger of the dominant hand and the fingernail of the middle finger of the non-dominant hand at (around) the middle knuckle of the non-dominant hand. This is a quite complicated letter. The contact of the fingernails is otherwise not observed in proper TİD signs (except for some iconic signs related to nails, e.g., “nail polish”). In B, also the fingernails of the index fingers and thumbs of the two hands make contact. In Y, the contact point is between the base knuckles of the index and the middle finger, where the perpendicular line of the letter Y is traced downwards. In X, the two index fingers cross between middle and upper knuckle.

Summarizing, most contact points are also phonologically licit: finger tips, base and middle knuckles. Others, however, are phonologically illicit: between knuckles, at fingernails. Moreover, more than two selected fingers
may share a single contact point. Taken together, these observations are consistent with the view that contact is not fully constrained phonologically, but guided phonetically, in TİD letters. Under the hypothesis that contact is driven by iconicity of the resulting letter shapes, we would expect to see a mixture of well-formed and ill-formed contact points – which is borne out by the data. This does not mean that the contact points are completely random. They are not. Rather, most of them are anatomically motivated, mostly making recourse to the knuckles and the fingertips. This fits with a picture where the set of phonologically selected contact points is a proper subset of the wider superset of phonetically motivated ones.

2.1.3 Prosodic constituency

TİD letters do not have to form a minimal prosodic unit, that is, a movement may be missing for a single letter. Since they are letters and not proper signs one may be inclined not to apply any prosodic constraint in the first place. Some one- and two-handed letters (our types 1, 2, and 3a) do not have movement, indeed, and only type 3b has various kinds of movement (see section 2). The set of TİD letters with movement (type 3b) comprises: İ, Ğ, Ü, Ö, J, Y, G, and Ş. Two of them, J and Y, show a tracing movement which depicts (a part of) the letter. This movement is more in the service of iconicity than in the service of a phonological requirement. As a matter of fact, it renders the otherwise static letter dynamic, but more epiphenomenally. Otherwise, J would be too similar to L. They only differ in their hand orientation: in L, the palm of the hand is facing, in J the back of the hand (see Figure 2). V is oriented on the X-plane with the back of the hand facing, while Y is oriented on the Y-plane. Ğ shows what can best be described as a hand-internal secondary movement, a wagging with the first section of the thumb of the dominant hand. In the remaining letters, İ, Ç, Ü, Ö, and Ş, the dominant hand adds one or two finger snaps to indicate the dot(s) and the cedilla. Although these additional movements fulfill the prosodic requirement of a minimal prosodic unit, they are quite different from regular movements. In particular the finger snaps only convey the movement and are not combined with any other phonological feature of the letter. There is still no movement in the overall two-handed letter. In Ş and Ğ, where the snapping and the wagging are conveyed with the dominant hand, that at the same time also forms a handshape of some sort, the combination with the movement is even odder in that parts of the hand (which clearly do not belong to
the “selected fingers” as in a genuine sign) which happen to be suitable are used for the snapping/wagging. The resulting letter is more a “kludge”, an idiosyncratic *ad hoc* formation, than a well-formed sign.

It has been argued that some letters (i.e., type 3b) do have movement and thus do not violate the prosodic constraints of a proper sign. Even in two-handed letters of type 3a, one may be tempted to also diagnose a movement since the dominant hand actively adds one part of the sign through a movement; however, this movement is not lexical, but just transitory, not even epenthetic. The contact, however, is salient and pronounced. The dominant hand does not just touch the non-dominant hand but makes a short and firm single contact. This salient contact differs from that found in usual TİD signs, e.g., from TAVUK ‘chicken’, a Battison type-3 sign where the index finger of the dominant hand contacts the palm of the non-dominant hand (repeatedly) somewhere in the middle (see Figure 1c). The selection of the exact location of the contact may follow from (i) the highly restricted location of the contact, typical of TİD letters, where contact with the non-dominant hand is mainly specified in terms of the knuckles, and (ii) the restriction of a single contact. Therefore, the dominant hand “knows” exactly where it should contact the non-dominant hand and makes sure that this single short contact becomes as salient as possible. Transition and tracing movements (as in type 3a and b letters) may be only phonetically specified. Actually, as long as TİD letter signs are still outside the core lexicon, there is no need to conform to any linguistic constraint. We argue below that it is only when TİD letters are integrated into the TİD lexicon that lexical movements are added to make the initialized signs phonologically well-formed. When letters (and numbers) in sign language are intended to be used in a sign, movement epenthesis (by minimal epenthesis or full epenthesis with primary and secondary movements) is common and the best way to conform them to a proper sign.

Sutton-Spence (2006) points out that the manual alphabets for sign languages have been constructed for raising the literacy of deaf signers in the 1600s, and that they are fairly artificial. They may therefore start out outside the phonological and lexical system of the sign language. From this perspective, TİD fingerspelling can be viewed as phonetic rather than phonological, at least in the earlier stages of its inception. However, this does not mean that fingerspelled letter signs are not related to phonological parameters at all. To the contrary, there are various signs that borrow fingerspelled letters, as in initialized signs, to which we will turn now.
3. The use of fingerspelled letters in TİD signs

Fingerspelling may violate phonological well-formedness conditions in terms of hand dominance, contact, and prosodic constituency, as pointed out in the previous sections. However, when signs are derived from fingerspelled letters, they start to conform to the phonological rules.

As we mentioned, one-handed letters in the TİD manual alphabet are signed with the non-dominant hand. However, when one-handed TİD fingerspelled letters are used as handshapes of lexical signs, they are signed with the dominant hand. For example, CEVAP ‘answer’ is signed with the dominant hand using the TİD C-handshape and with a path movement. The C letter becomes phonologically well-formed by adapting to two main phonological constraints, namely dominance and prosody: (i) one-handed signs are signed with the dominant hand and (ii) a path movement is added (through movement epenthesis) in order to obtain a prosodically well-formed sign.

Some letters have unusual contact points which may not be used in a sign (see section 2.1.2). Therefore, the finger configuration of a one-handed sign whose handshape is derived from a TİD letter may change to make it compatible with phonological requirements on contact with a phonologically specified contact point. For example, the P-handshape in the handshape inventory and the P letter in the manual alphabet differ in interesting ways (Figure 4).

![Figure 4](image-url) (a) The P-handshape in the TİD handshape inventory (signed with the dominant hand) and (b) the P letter in the TİD bimanual alphabet

In the letter P (signed with the non-dominant hand, see Figure 4b), the middle finger is bent and contacts the straight index finger somewhere in the middle (at or slightly below the middle knuckle). In the P-handshape (signed with the dominant hand, see Figure 4a), the index finger is bent and contacts the middle finger at around the middle knuckle. Obviously the P letter is related to the P-handshape. Thus, there exist initialized signs for words starting with P (e.g., PSIKOLOJİ ‘psychology’ in which the dominant hand (with the P-
handshape) contacts the right forehead laterally with a short reduplicated movement; see video in the appendix). These signs, however, do not make use of the letter P but of the P-handshape. The reason may be the fact that the P-handshape is already in the handshape inventory of TİD; hence there is no reason to use the letter P as a handshape. Moreover, it is actually hard to produce physically. The bending of the longer middle finger of the non-dominant hand and the contact at around the middle knuckle of the index finger, as in the letter P, are somewhat more challenging movements than the bending of the shorter index finger of the dominant hand and the contact at around the middle knuckle of the middle finger, as in the P-handshape. A reason why there is no reverse adaptation of the letter P to the P-handshape may be that the P-letter – though harder to produce – is more iconic, that is, it resembles the letter P more, physically, through the more pronounced rounding which is possible with the middle finger. Also, the letter P was probably contrived independently from the P-handshape, as part of the overall TİD alphabet, and therefore has retained some degree of autonomy. We therefore have to revise our previously made claim in section 2, that one-handed TİD letter signs serve at the same time as TİD handshapes slightly. This is true except for P. When P is used in initialized TİD signs, the P-handshape (see Figure 4a) rather than the letter P (see Figure 4b) is used. That the P-handshape is a regular handshape used also for non-initialized signs can be seen in signs such as KAVGA-ETMEK ‘quarrel’ (see video in the appendix).

As for prosodic constituency, there are various kinds of phonological processes by which one-handed and two-handed TİD letters may contribute to the TİD lexicon. In producing initialized signs, the strategies are mostly adding a path, an arc, or a hand-internal wrist movement to the letter. For example, the L, which is one of the one-handed TİD letters, has three different initializations: “Path movement”: LAZIM ‘need’ (Figure 5a), “arc” movement: LİSE ‘high school’ (Figure 5b), and “wrist movement”: LOKAL ‘association’ (Figure 5c) (Kubus, 2008).

![Figure 5](image_url) (a) LAZIM ‘need’ (b) LİSE ‘high school’ (c) LOKAL ‘association’ (see videos in the appendix)
Two-handed TİD letters may similarly engage in initializations. A lexical movement of the dominant hand or a reduplicated and therefore more pronounced contact of the dominant hand with the non-dominant hand satisfies this basic requirement. Small epenthetic contact movements are used in TEŞEKKÜLER ‘thanks’ with the T-letter (Figure 6b) and in FEDERASYON ‘federation’ with the “F” letter (not shown, but see video in the appendix). “Path movements” are used in TAKSİ ‘taxi’ with the T-letter (Figure 6a), in DOLMUŞ ‘minibus’ with the D-letter, and in SORU ‘question’ with the S-letter (not shown, but see videos in the appendix).

Another use of fingerspelling is to form derivational morphemes adopted from spoken Turkish (Kubus, 2008). There are two such morphemes in Turkish: (i) -CI\(^{15}\) (-cı, -ci,-cu, -cü, -çı, -çi, -çu, -çü) provides the meaning “seller of something” to the root and is equivalent to the -er suffix in English and (ii) –LI (-lı, -li, -lu, -lü) conveys the meaning of “belonging to something”, “place of origin” or “being endowed with something, containing something”. From these sets, TİD realizes -C-I/-C-U and -L-I/-L-U (see Figure 7a and b):

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Figure 6. (a) TAKSİ ‘taxi’ (b) TEŞEKKÜLER ‘thanks’ (see videos in the appendix)

Figure 7. (a) the suffix -C-I (b) the suffix -L-I (see videos in the appendix)
TİD uses these suffixes in the same meaning as in spoken Turkish, where they are widely used; however, in TİD, they occur less frequently. Since the letters L, C, I and U are one-handed, it is easy to combine them, as in ANKARA^L-I ‘from Ankara’ or İSTANBUL^L-U ‘from Istanbul’. Between these two letters (C-I and L-I), a forward path movement is added, following the movement epenthesis rule which makes the suffix prosodically well-formed (see Figure 7 a+b). The movement change between the two letters occurs during the forward path movement. Note also that the letters of the suffix are signed with the dominant hand and not with the nondominant hand – as one-handed TİD letters normally are. These examples of fingerspelled morphemes in Figure 7 resemble most closely to the many examples of initially fingerspelled words in ASL that become contracted in the course of language change, such as N-O or J-O-B (Emmorey, 2001, 20).

Short fingerspelled sequences may also be used as abbreviations for words such as P-J (‘proje’ (‘project’)) or C-C (‘Coca Cola’, Taşçı, 2011).

Summing up, the change of dominance of one-handed TİD letters, the peculiar state of the letter P, initialized one- and two-handed signs and the contraction of fingerspelled derivational suffixes in TİD indicate that phonological well-formedness conditions of lexical signs have to be met when TİD letters become integrated into the TİD lexicon. Hence, phonetics eventually conforms to phonology. This line of reasoning is similar to Padden’s (1998) and Brentari and Padden’s (2001) adaptation of Itô and Mester’s (1995) “core-periphery” structure where native words that fully adhere to the phonological constraints of the language reside in the center and foreign loan words at various distances from it in the periphery (as summarized in Emmorey, 2001, 18ff.). Dynamically speaking, the periphery corresponds to the outskirts of the “basin of attraction” and the center to the attractor itself. Padden and Brentari (2001), however, did not consider single fingerspelled letters, as we do here, but whole fingerspelled words, as they gradually undergo prosodification on their way from the periphery to the core. We were looking closely at single TİD manual letters for two reasons. The first reason is that these letters are predominantly bimanual and can thus be checked as to their adherence to the constraints on the use of the two hands, as in two-handed signs. The second reason is that there are actually few signs in TİD that derive from fingerspelling of the letters of the respective word, in contrast to the rich set of such words in ASL, for example. Fingerspelled words are rarely used in TİD and native signers use relatively little fingerspelling overall. This may be due to the fact that Deaf Turkish people mostly have difficulties in reading and writing. Native TİD users generally fingerspell when they want to sign their names and those of specific places, as well as words which
do not have a proper sign (yet). It may also be that a bimanual dactylological alphabet is simply not suited to form signs from – if already a single letter can be quite complex and behaves like a little bimanual sign itself. As a consequence, the resulting whole word would almost inevitably violate the prosodic constraints. Consistent with this idea is the observation in Kubus (2008) that only short free and bound morphemes are fingerspelled, such as U-N ‘flour’ and the derivational morphemes -L-I and -C-I, which, in addition, become contracted into a single syllable.

4. Summary and conclusion

All tests for violations of phonological well-formedness in TİD manual letters were positive to varying extents. Some of the phonological constraints may not, some may be fulfilled, among them those that are fulfilled in a more coincidental or epiphenomenal way, as in the case of various sorts of contact points, unmarked handshapes for the non-dominant hand, and transitory movements in type 3a bimanual letters which could arguably fulfill a minimal prosodic requirement. However, we also found that some very basic constraints are strictly fulfilled, namely the fact that movement is always a matter of the dominant hand (for letters of type 3a and b). Others are mainly fulfilled, as with the predominant choice of motivated contact points. We conclude that TİD manual letters are best to be described phonetically where phonetics is considered as a superset of anatomically and physically motivated features from which the phonology of a sign language may select a proper subset of phonologically licit features for linguistic purposes.

In this article, we have explored the lower and upper limits of the phonological requirements on well-formed (one- and) two-handed TİD letters and signs formed from them. On the one hand, TİD letters typically fail to achieve basic and minimal phonological requirements on hand dominance, contact, and prosody. This, however, does not seem to be problematic as long as they remain outside the TİD lexicon. If, however, they are to be used as handshapes or as signs (as in initialized signs), they need to shift their hand dominance (one-handed letters swap dominance when used as a handshape in a TİD sign), selected fingers and contact (as with the letter P), or be augmented with a movement of some sort (primary or secondary). If, on the other hand, a sequence of TİD letters is used as a morpheme or word, this sequence typically exceeds the prosodic limits of a phonological word. As a consequence, the fingerspelled word or morpheme needs to be contracted in order to keep within the limits of a well-formed word (Hohenberger, 2008).
TÎD, in the course of its history, has successfully resolved those “interface” problems between phonetics and phonology, through constant accommodation of requirements from both sides – “inside out” (from phonetics to phonology) and “outside in” (from phonology to phonetics). Here we have discussed the shift from a system based on phonetic regularities (the TÎD bimanual alphabet) to a system based on phonological constraints (the TÎD core lexicon). Yet the rift between the two must not be blurred. When conflicting requirements between phonetics and phonology compete, rather striking symmetry breaks in favor of phonology may occur, as in the discrete shift of hand dominance or switch of fingers. These adaptations of TÎD letters to signs can also be understood in terms of a movement from the periphery to the core of the TÎD lexicon. Placed at the periphery initially, TÎD finger-spelled letters have found their way into the TÎD lexicon, although opportunities of integration may be fewer as compared to other sign languages, partly due to the historical and educational situation in Turkey, partly also due to the dactylological and bimanual nature of the TÎD alphabet.
Notes

1. We would like to thank two anonymous reviewers and Rachel Channon for their valuable comments on earlier drafts of this chapter.
2. Although the TİD alphabet is called “bimanual”, some letters only use one hand, as will be discussed in detail in section 2.
3. We will mainly be concerned with the role of single TİD letters or short derivational suffixes as they enter the TİD lexicon and not with fingerspelled words which are extremely rare in TİD (see section 3; see also Taşçı (2011)).
4. Battison (1978) determined these phonological constraints by considering only ASL. However, they seem to be universal and therefore also applicable to other sign languages including TİD. There exist examples in TİD for each of Battison’s categories; hence it can be assumed that TİD follows the symmetry and dominance condition, as well. However, the set of passive handshapes defined in the Dominance condition is not universal and may thus differ between sign languages. Kubus (2008) listed the following unmarked handshapes found in the non-dominant hand in Type-3 TİD signs: B, A, A-bar, S, F (TİD-O), 1 and 5 (see section 2.1.1 and Figure 3).
5. Sandler and Lillo-Martin (2006, 223) have revised Mandel’s original definition insofar as they refer to the morpheme and not to the sign anymore as the domain of this constraint. In the context of our paper this refinement is irrelevant, though.
6. This section has been inspired by the comment of an anonymous reviewer of an earlier draft of this chapter to whom we are indebted for pointing out inter- and cross-modal aspects of “letter names”.
7. These letter names mostly have no meaning in Greek but were taken over from the earlier Phoenecian alphabet where, for example, “aleph” means ‘ox’ and “bet” means ‘house’ (http://en.wikipedia.org/wiki/Greek_alphabet).
8. There are three other letters, W, Q, and X, which, however, occur very rarely in Turkish and therefore also in the TİD alphabet. W and X are type 1 letters and Q is a type 3a letter.
9. In section 3, we argue that the letter P is different from the P handshape. Therefore, strictly speaking, the letter P is not within the set of TİD handshapes.
10. The defined handshapes that are found in the TİD handshape inventory are not necessarily related to initialized signs, as in: C-/U-handshape: DERNEK ‘association’; I-handshape PAZAR ‘Sunday’; L-handshape: FESTİVAL ‘festival’; P-handshape: KAVGA ‘quarrel’ (see also section 3); V-handshape: SERBEST ‘free’.
11. See footnote 8.
12. There are two variants of K, the Istanbul variant K-İ, which is a type 2 letter, and the Ankara variant, K-A, which is a type 3a letter. In Figure 2, both variants are depicted.
Here, we would like to relate our findings to the SignTyp database. It includes 6 different languages (ASL, Japanese Sign Language, Sign Language of the Netherlands, New Zealand Sign Language, Finnish Sign Language, and Korean Sign Language) and 9 datasets (2 languages, ASL and Finnish Sign Language, have datasets from different time periods). In this database, when the handshape of the non-dominant hand differs from that of the dominant hand, the distribution is as follows: B (flat hand unspread with thumb in palm or next to index): 58.3 % (of a total of n=2004); S (fist with thumb grasping fingers): 7.4 %; A (fist with thumb next to index): 1.5%; Index (index extended, all other digits closed): 6.1%; C (all fingers curved, thumb opposed and curved and no contact): 4%; O (all fingers contact thumb in circular O shape): 2.3%. Therefore the total of all “Battison“ handshapes amounts to 83.8%. The remaining 16.2 % comprise other handshapes. Channon (2004) suggest that the Dominance Condition with respect to handshapes may not be so much a constraint as a set of constraints which result in a distribution where the “Battison” handshapes predominate but others are also possible. She further argues that the non-dominant handshape is a result of phonetic, phonological and iconic factors: 1) several simple phonetically based constraints (be perceptually salient, be physically easy, be cognitively easy to produce), 2) the requirements that the phonological place (or occasionally places) be contacted, and 3) in a few cases, a requirement to be iconic. We owe this information entirely to Rachel Channon.

In Turkish linguistics, capital letters in –CI and –LI are used as abstractions from the concrete instantiations of the consonant and the vowel in the suffix. Depending on the preceding consonant, the consonant C can surface either as [c] or as [ç], that is, accommodation with respect to the feature “voice” takes place. Depending on the vowel feature of the preceding stem, the vowel I can surface either as [ı], [i], [u], or [ü], according to the rules of vowel harmony. In the terminology used here, however, –C-I and –L-I are used as glosses. Note that in TİD, only –L-I/-L-U and –C-I/C-U exist. This is because the letters for the other two vowels, I and Ü, and for the consonant Ç, involve both hands. Since, however, the hand dominance has switched from the non-dominant to the dominant hand it is no longer available for adding the necessary finger snaps. Furthermore, the lexical path movement and the hand-internal letter movement would clash.

A short history of TİD and the educational system of the Deaf in Turkey is provided by Zeshan (2003).

Note that U-N ‘flour’ is very short in the first place and therefore a good candidate for lexicalization. In smooth signing, the two letters become contracted into a single syllable whereby the change between the two letters occurs during the orientation change of the hand.
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Appendix:

All letters of the TİD alphabet and the following TİD morphemes and words can be seen as videos on the accompanying CD:
C-I, C-U, DOLMUŞ, FEDERASYON, KAVGA, LAZIM, L-I, LİSE, LOKAL, L-U, PSİKOLOJİ, SORU, TAKSİ, TEŞEKKÜRLER, U-N.