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## Age of Language Acquisition and Prevalence of Suicidal Behavior in a Deaf Population with Co-occurring Substance Use Disorder

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## Introduction

People who are deaf encounter multiple obstacles in gaining knowledge of the world around them, including communication barriers between a deaf person and their parents and teachers, public misconceptions and stigma about deafness, and a scarcity of accessible information during early development (Guthmann & Moore, 2007). These issues are sometimes compounded by delayed exposure to language and cultural misunderstandings in part due to language differences. If language and cultural acquisition are delayed through major developmental milestones of childhood, deaf individuals may have less access to the tools necessary to build social support and a positive social identity. Thus, a person who is first exposed to language at a later point in life will have to confront the emotional ramifications of their childhood isolation (Pettis, 2014; Schaller & Sacks, 1991), and this delay may be tied to mental illness (Flouri, 2005). Some research suggests that as many as 75% of deaf individuals with co-occurring mental illness may have sign language proficiency that falls into disfluent ranges (Black & Glickman, 2006), and many of these individuals may have had an absence of language extending many years. This study investigated whether an absence of language early in life may contribute to known risk factors for suicidal behavior, including suicidal gestures and parasuicide.

Although research on suicidal behavior and deafness is scant (Turner, Windfuhr, & Kapur, 2007), some investigators have suggested that deaf individuals may be at greater risk for suicidal behaviors than hearing individuals (Embree, Wilson, Fraker, Castle, & Moore, 2012; O'Hearn & Samar, 2009; Samar et al., 2007). A variety of reasons has been given for the increased risk of suicide, including biological factors, history of psychiatric illness, ineffective education, social isolation, unemployment, sexual abuse, substance use disorder (SUD), and trauma (Flouri, 2005; Kessler, Berglund, Borges, Nock, & Wang, 2005; Martinotti, Tedeschi, Di Giannantonio, Roy, Janiri, & Sarchiapone, 2009; Russell, Turner, & Joiner, 2009; Sebald, 2008; Tate, 2012; Turner et al., 2007). Many risk factors are assumed to be comparable to the hearing population (Turner et al., 2007), but some investigators question the value of these comparisons (Connolly, Rose, & Austen, 2006), particularly in the case of mental health factors (Griggs, 2000). Recent research also suggests that mental health factors with co-occurring SUD compound each other (Bakken & Vaglum, 2007). Although risk factors specific to deaf populations are not fully known, lack of role models and alienation from family and peers could contribute to their increased risk of suicide (Turner et al., 2007).

The lifetime prevalence rate of suicide attempts and/or suicidal ideation in

individuals with physical or mental disabilities and SUD has been reported to range from 10% to 30%, with women reporting attempts more often than men (Bakken & Vaglum, 2007; Russell et al., 2009). Suicidal behaviors could be adaptive communication attempts that might be expected from populations with delayed language acquisition and limited modes of communication. Suicidal gestures and parasuicide can be a “cry for help” rather than a legitimate attempt at ending one’s life (Van Orden, Witte, Cukrowicz, Braithwaite, Selby, & Joiner, 2010). These maladaptive attempts at communication may not be interpreted correctly using a “hearing standard.” Understanding the connection between age of language acquisition and mental health will enable service professionals to assess individual risks more accurately and provide more appropriate treatment for deaf clients (Pettis, 2014).

### **Deafness and Language Acquisition**

Some of the factors that set deafness apart from other disabilities are language, communication, and culture (Edmondson, 2006; Pettis, 2014). Prelingually deaf individuals were the focus of this study because they represented a population that did not have prior access to other forms of language and had delays in age of language acquisition. It is the effect of this delay that is hypothesized to increase rates of suicidal ideation and attempts.

Communication does not always rise to the level of language (Friedmann & Rusou, 2015). Like hearing children, every deaf child can be placed on a continuum of language mastery (Friedmann & Rusou, 2015). Research has demonstrated great variation in sign language abilities among deaf individuals (Connolly et al., 2006; Edmondson, 2006; Pollard, 1998), with some children developing language mastery at earlier ages than the general hearing population and others going decades with little more than the visual equivalent of echolalia (Schaller & Sacks, 1991). Some studies have found deaf children’s expressive and receptive abilities to be significantly lower than those of hearing children (Barker, 2009), but many such studies are biased because they specifically exclude sign language by defining language as a spoken form of communication. American Sign Language (ASL) is a separate and distinct language with its own syntax and grammar that are different from spoken and written English (Moore, Guthmann, Rogers, Fraker, & Embree, 2009). To avoid any confusion, this study included any and all languages, including ASL, in the language acquisition variable.

## **Cognitive and Linguistic Development in Deaf People**

Approximately 90% of deaf children are born to hearing parents (Edmondson, 2006). Oral language in a hearing environment is often linguistically inaccessible for the developing deaf child and, at best, includes combinations of communication forms that may or may not constitute language (O'Rourke & Grewer, 2005). In these families, a range of communication styles may be used, including ASL, pidgin signed English (PSE), home signing (unique to a particular family or group), spoken language, gestures, and even acting out stories (Schaller & Sacks, 1991).

Many deaf children born to hearing parents learn communicative skills from a non-native signer whose skills may lack sophistication. The parents may seldom communicate with each other in sign language, making incidental learning more challenging. Incidental learning of language can exist in a home where ASL is the primary form of communication. Studies have found significant differences between native signers and late signers distinguishing between those children born to deaf parents who use ASL and those to hearing parents who do not, respectively (Edmondson, 2006; Pettis, 2014). In particular, native signers are more likely to differentiate between their own experiences and knowledge and the experiences and knowledge of others. This is an important area of social functioning among developing children, allowing them to use their understanding of others' beliefs to predict their behavior (Edmondson, 2006).

Language also plays a crucial role in the development of emotional and behavioral regulation, as well as cognitive growth (Barker, 2009; Parasnis, 1998). Little or no communication can result in social and cognitive isolation that could lead to social normlessness (Twersky-Glasner, 2006; Van Orden et al., 2010). The resulting disconnect can have a wide range of consequences. Deaf children who are born into such situations may grow up without opportunities to participate in many of the linguistic interactions crucial to the development of language and therefore may fail to develop a strong linguistic base, if they are able to develop one at all (Twersky-Glasner, 2006).

The current study focused on persons who are prelingually deaf (i.e., their hearing loss occurred prior to their opportunity to develop language orally). The age at which a person acquires language has many ramifications for their future life (Locke, 2002). Most obvious is the effect on their ability to acquire language at all. The critical period hypothesis is perhaps the most well-known concept in this area and refers to the extent to which a person's ability to acquire language is tied to age (Friedmann & Rusou, 2015). While children generally demonstrate

the ability to understand and effectively use language at around three years of age (Edmondson, 2006), the hypothesis states that if a person does not acquire language by a certain age (approximately the onset of puberty), they are less likely to develop mastery of language later in life, if at all. This is a heavily debated theory and points to the need for additional research in this area (Friedmann & Rusou, 2015). However, individuals who are prelingually deaf and who are not exposed to a culturally deaf environment have barriers to language acquisition (ASL or English). They cannot access major aspects of hearing culture. Without access to sign language and other deaf peers, they also cannot access the deaf community.

### **Substance Use Disorder in Deaf Populations**

Rehabilitation literature suggests a high prevalence of substance use disorder among persons with disabilities, including deaf individuals (McAweeney, 2007; Moore et al., 2009; Morere et al., 2009). There is debate as to how much of the incidence of SUD in the deaf population is the result of poor prevention education and how much could be reduced with reasonable accommodations from treatment providers (Guthmann & Moore, 2007). Some research suggests that deaf individuals who are not connected to Deaf culture may be at greatest risk of SUD (Guthmann, 2005), and that those individuals already isolated from the larger hearing community are even more isolated as a result of their SUD (Moore et al., 2009). Additionally, population surveys demonstrate that up to 45% of individuals with a SUD report past suicide attempts (Ilgen, Harris, Moos, & Tiet, 2007).

Although very little research exists focusing on suicidality among deaf individuals with SUD, there is a well-established link between suicidal behavior and substance abuse in the general population. Individuals with SUD are at 10 times greater risk for suicide, and it remains the leading cause of death among individuals who abuse substances (Wilcox, Conner, & Caine, 2004). Recent research has found that for those with co-occurring SUD and mental illness, suicide attempts were reduced with SUD treatment to a greater degree than with mental health treatment (Ilgen et al., 2007).

### **Co-occurrence of Diagnoses in Deaf Populations**

Research suggests that deaf individuals in the general population (Fellinger, Hozinger, & Pollard, 2012; Kvam, Loeb, & Tambs, 2007) and in outpatient/inpatient psychiatric treatment (Black & Glickman, 2006; Turner et al., 2007) have higher rates of psychiatric disorders than hearing individuals. Some

have argued that it is reasonable to expect increased mental health problems when deaf individuals are isolated and deprived of communication as adults (O'Rourke & Grever, 2005). These estimates should be interpreted cautiously, particularly due to the frequent use of inappropriate communication of survey items and audiocentric assessment instruments (Connolly et al., 2006; O'Hearn & Samar, 2009). In a study of deaf individuals with co-occurring mental illness in inpatient psychiatric treatment, 75% of participants were judged to be language disfluent (Black & Glickman, 2006). However, there is little research that has investigated depression in prelingually deaf individuals (Connolly et al., 2006). Regardless, deaf individuals with mental illness are less likely to seek treatment for their symptoms (Pettis, 2014).

The relationship between mental illness and suicidal behavior in the general population is well-established (American Association of Suicidology, 2007; Bakken & Vaglum, 2007), and regardless of the disorder, people with mental illness are dramatically overrepresented among completed suicides (Cavanagh, Carson, Sharpe, & Lawrie, 2003). Studies of dually-diagnosed individuals indicate that co-occurring SUD and psychological disorders cumulatively increase the likelihood of suicidal behavior, and the association between suicidal behavior and mental health increases with each additional diagnosed disorder (Bakken & Vaglum, 2007, Russell et al., 2009). Increased prevalence of mental health diagnoses in association with higher rates of attempted suicide in certain deaf subpopulations has been reported (Turner et al., 2007; Connolly et al., 2006), but much more research is needed in this area.

### **Suicide & Suicidal Behavior in Deaf Populations**

Although studies involving deaf community members (O'Hearn & Samar, 2009; Samar et al., 2007) and deaf individuals in SUD or psychiatric treatment (Embree et al., 2012; Turner et al., 2007) suggest that they may be at greater risk for suicidal behaviors than hearing individuals, a lack of research contributes to significant gaps in the understanding of suicidal behavior in deaf populations. This gap may be due in part to the heterogeneous nature of the deaf population, and the costs of such research may be prohibitive due to the need for interpreting, appropriate instruments, and additional staff time (Connolly et al., 2006; Turner et al., 2007). Given the absence of research to suggest otherwise, risk factors are assumed to be comparable to the general population (Turner et al., 2007); although deaf-specific risk factors, including social isolation and alienation from family and friends as a result of language delay, remain largely unstudied. Some investigators have suggested that language delay and the effect of cultural dissonance on deaf individuals contribute to what may be perceived as deviant

behavior, including self-harm, substance use, and maladaptive communication gestures (Twersky-Glasner, 2006). Recent research found a significant association between English reading skill and suicide attempts in deaf college students, particularly women (O'Hearn & Samar, 2009, Samar et al., 2007). Suicide attempts can function as communication with key figures in the individual's environment (Van Orden et al., 2010). In this way, a suicide attempt may be a cry for help from a person who knows no other way to express a severe emotional need, or it may be the latest manifestation in a long line of maladaptive communication attempts with the very people who neglected the previous efforts to communicate.

### **Hypothesized Model**

The purpose of this study was to evaluate the relationship between age of language acquisition and suicidal behavior in deaf individuals. To address this question, a secondary analysis was conducted of data collected with deaf adults engaged in SUD treatment. The study goals were to evaluate the potential relationship between age of language acquisition and prevalence of (1) past suicidal ideation and (2) past suicide attempts within a sample of persons who are deaf and have been diagnosed with SUD. We hypothesized that those who acquired language later in life (after age 10) would have higher rates of past suicidal behaviors compared to those that acquired language earlier in life.

Delayed language acquisition can contribute to the development of suicidal behaviors in two ways, by limiting the means to communicate and by disrupting social development. For some deaf individuals, social maladjustment may lead to behavioral disorders, including mental illness and SUD, which are closely associated with suicidal behavior. However, some deaf individuals with delayed language acquisition do not develop the ability to communicate effectively and resort to suicidal gestures or parasuicide as a means of communication. Our hypothesized model is illustrated in Figure 1.

### **Method**

#### **Participants**

Participants received SUD treatment in the Deaf Off Drugs & Alcohol (DODA) program, funded by a grant (TCE#1H79T1019320) from the Substance Abuse and Mental Health Services Administration. The Institutional Review Board at Wright State University approved this study for secondary analysis, and all participants were treated in accordance with the ethical principles of the

American Psychological Association. Participants were deaf adults in SUD treatment ( $n = 107$ ) from several midwestern states (Indiana, Kentucky, Ohio, and Pennsylvania), but the majority (82.2%) were residents of Ohio. The reason for this wide geographical distribution was a very low incidence of individuals who are deaf with co-occurring SUD per region. Although the DODA program served 149 consumers during the life of the grant, this number included hard-of-hearing individuals and deaf individuals whose onset of deafness occurred after they had acquired language. Data from hard-of-hearing individuals and postlingually deaf individuals ( $n = 42$ ) were not included in the analyses. Because all participants were from a substance abuse treatment program, they were all in some stage of recovery from or active use of alcohol or illegal drugs.

## Procedure

Data was collected as part of the intake process into the DODA program and subsequently used for this secondary analysis. The data was originally collected as part of the effort mandated by the Government Performance and Results Act (GPRA), including CSAT- GPRA Core Client Outcome Measures. It was locally collected from self-reported mental health diagnoses and language assessment forms specific to the DODA program. DODA staff conducted intakes in the preferred primary language of the consumers. Staff members were hearing counselors who had worked specifically with deaf consumers for more than 30 years.

Variables obtained from the GPRA instrument included the participants' age, gender, race, ethnicity, and education. Additional questions asked at intake were developed by the research staff to allow clinical staff to provide more appropriate treatment to deaf clients. Questions regarding language proficiency included age of language acquisition and modes of communication (ASL, Pidgin Signed English, and/or the oral method, i.e., English). Other questions inquired about past mental health diagnoses (yes/no), past suicide attempts (yes/no), and past suicidal ideation (yes/no). The questions related to past suicide attempts and past suicidal ideation are given below in English and are glossed to provide the closest approximation of the wording in ASL of the questions asked for those variables. No participants reported suicide attempts currently (in the past 30 days) and the questions below were originally intended only to give the counselors an idea of the consumers' past behavior.

### **“Have you attempted suicide in the past?”**

YOU – PAST – FINISH – TRY – KILL – SELF – YOU – KNOW – THINK – SAME – AS – CUT – WRIST – HANG – SHOOT – UNDERSTAND – YOU?

**“If not, have you ever thought about harming or killing yourself”**

YOU – NEVER – TRY – KILL – SELF – BUT – SOMETIMES – THINK – HURT – KILL – SELF – YOU?

**Data Analysis**

Descriptive statistics were calculated for demographic information, suicidal behaviors, and age of language acquisition. Chi-square analyses were utilized to analyze the association between past suicidal behaviors (suicide attempts and suicidal ideation) and socio-demographic variables, including gender (male/female), mental health diagnosis (yes/no), and age of language acquisition. For analyses evaluating the relationship between suicidality and age of language acquisition, participants were divided into two groups: participants who acquired language before the age of 10, and participants who acquired language after the age of 10. The age of 10 was selected to divide participants based on the critical period hypothesis, which theorizes that, if a person does not acquire language by a certain age (approximately the onset of puberty), they are less likely to master language later in life (Friedmann & Rusou, 2015). The primary dependent variables for this secondary data analysis were past suicide attempts (yes/no) and past suicidal ideation (yes/no). Statistical significance was set at  $p = .05$  for the analysis.

**Results**

The sample included 63 men (58.9%) and 44 women (41.1%). The mean age was 39.6 years ( $\pm 10.9$ ) and age ranged from 19 to 67 years at the time of intake. Sixty-seven participants (62.6%) identified themselves as Caucasian, 22 participants (20.6%) as African American, six participants (5.6%) as Latino, and 12 (11.2%) chose not to respond (Table 1). Mean years of education were 12.2 years ( $\pm 1.7$ ), and 62 participants (77.6%) reported a high school diploma or equivalent. Twenty-six participants (25.2%) were employed at least part-time at the time of intake.

**Language and Communication**

The mean age of first language acquisition overall was 65.9 months ( $\pm 45.1$ ). The distribution was tri-modal with distinct groups summarized in Figure 2. The first group had a mean age of acquisition of 29.2 months ( $\pm 12.8$ ), with a range from 12 to 48 months. The second group had a mean age of acquisition of 71.3 months ( $\pm 14.8$ ), with a range from 54 to 114 months. Lastly, 16.8% of participants ( $n = 18$ ) were significantly delayed with a mean age of acquisition of

149.3 months ( $\pm 32.0$ ), with a range from 120-240 months. This last group represents those participants who would traditionally be considered to have missed the critical period for developing language. Some participants indicated proficiency in more than one mode of communication. Seventy-two participants (67.3%) used ASL, 33 (30.8%) used PSE, and 13 (12.1%) used oral communication. There was no significant difference between age-of-acquisition groups in their preferred mode of communication, although participants who used ASL were slightly more likely (23.5%) to be represented in the group with the earliest age of acquisition.

### **Suicidal Behavior**

Forty-five participants (42.1%) reported having attempted suicide in the past, although none reported suicide attempts in the 30 days prior to the intake interview. Fifty-four participants (50.5%) reported past suicidal ideation. Table 2 depicts the relationship between suicidality and age of language acquisition. Of the 18 participants with significantly delayed language acquisition (i.e., language acquisition after the age of 10 years), 11 (61.1%) reported having attempted suicide in the past. The difference between the rates of suicide attempt was marginally significant,  $X^2(df = 1, n = 107) = 3.22, p = .06$ , with those participants whose language acquisition was significantly delayed reporting a rate 22.9% higher than the rate for participants whose age of language acquisition was less than 10 years. Suicidal ideation was also higher among participants from the group with the greatest delayed language acquisition, but not significantly so,  $X^2(df = 1, n = 106) = 2.14, p = .11$ . Two-thirds of participants with delayed language acquisition reported suicidal ideation, whereas 47.7% of participants with language acquisition before age 10 reported suicidal ideation.

### **Mental Health Diagnosis**

A total of 48 participants (42%) reported being diagnosed with a mental illness. Participants with a past mental health diagnosis were significantly more likely to report a past suicide attempt ( $X^2(df = 1, n = 96) = 17.14, p < .001$ ), as well as past suicidal ideation ( $X^2(df = 1, n = 95) = 10.11, p < .001$ ), compared to participants who reported no mental health diagnosis (Table 3). Of those participants who reported being diagnosed with a mental illness in the past, 30 (62.5%) reported past suicide attempts, and 31 (66.0%) reported suicidal ideation. Of those participants who reported past mental health diagnoses, those who acquired language after age 10 were not significantly more likely to report past suicide attempts or past suicidal ideation than those with earlier language acquisition.

## Gender Comparisons

Men and women did not differ significantly in age, race/ethnicity proportions, prevalence of prior mental health diagnosis, or age of language acquisition. Women were significantly more likely to report past suicide attempts ( $X^2(df = 1, n = 107) = 8.90, p = .003$ ) and suicidal ideation ( $X^2(df = 1, n = 106) = 5.82, p = .016$ ). Differences between male and female responses are illustrated in Table 4 and Table 5. Male participants who reported a past mental health diagnosis were significantly more likely to report past suicide attempts ( $X^2(df = 1, n = 55) = 14.65, p = .0001$ ) and suicidal ideation ( $X^2(df = 1, n = 55) = 9.53, p = .002$ ). Those who acquired language after the age of 10 years were not significantly more likely to report either behavior, although the number who reported past suicide attempts was marginally greater than those who acquired language before the age of 10 ( $X^2(df = 1, n = 63) = 3.76, p = .053$ ), and the trends for both were in keeping with those of the overall population. Four of the six male participants (66.7%) who reported past mental health diagnosis and significantly delayed language acquisition also reported past suicide attempts and suicidal ideation, but this percentage was not significantly greater than those who did not report past mental health diagnosis.

Female participants who reported a past mental health diagnosis were also significantly more likely to report past suicide attempts ( $X^2(df = 1, n = 40) = 4.64, p = .033$ ) than those who did not report a past mental health diagnosis, but not suicidal ideation. Those who acquired language after the age of 10 years were not significantly more likely to report either behavior, although the trends for both were in keeping with those of the overall population of this sample. Female participants who reported past mental health diagnosis as well as significantly delayed language acquisition reported suicidal behavior in all cases ( $n = 4$ ). Although the difference was not significant, these participants represented the highest percentage (100%) of reported suicide attempts and suicidal ideation in the study (Table 5). This dramatically high proportion is of interest, but not great enough to permit rejection of the null hypothesis.

## Discussion

The intention of this secondary analysis was to explore the possibility that a delay in language acquisition is associated with suicidal behavior. The population sampled was specific (i.e., those in treatment for substance abuse) and very different from the vast majority of the Deaf community. Deaf individuals face a myriad of barriers to substance abuse treatment and are among the most underserved populations in the United States. This study was an opportunity to

delve into a facet of that historically understudied population that has increased prevalence in both suicidal behavior and significantly delayed language acquisition. The exploration of language acquisition in this study is in no way intended to blame Deafness for the increased incidence of suicide attempts. Instead it illustrates the importance of language development on emotional wellness, no matter what that language might be.

The neglect and trauma that some suffer in childhood may be the result of ignorance or even prescribed by doctors in an effort to “teach” a child to engage in the hearing world. A large percentage of today’s deaf adults were raised where the Deaf cultural model was not generally accepted, and the medical model of deafness as a “problem to be fixed” was the norm. Although these standards are changing, the adults who grew up in that environment represent a group under chronic stress from labored interactions over the years. Research suggests such chronic cultural stress is significantly associated with suicidal ideation (Russell et al., 2009).

As illustrated in Table 5, the lifetime prevalence of suicide attempts increases with mental illness and delay of language acquisition. The prevalence for suicide attempts with comorbidity of SUD and co-occurring mental illness was also higher in this sample than previous studies suggest (Bakken & Vaglum, 2007; Wilcox, Conner, & Caine, 2004). Each of these factors was amplified among those participants with significantly delayed language acquisition. The arguments in the literature, however, only rarely include discussion of sign languages. Discussion of sign language is certainly an area ripe for study, especially considering the wide range of communication types used in the Deaf community and the percentage of Deaf adults whose age of language acquisition was critically delayed. Although caution should be exercised when comparing these results with the hearing population, they underscore the need for increased attention and further inquiry among deaf populations.

The comorbidity of SUD and mental illness increases the likelihood of suicide attempts for deaf populations (Bakken & Vaglum, 2007; Guthmann, 2005). Delay of language acquisition may contribute to these recognized risk factors for suicidal behavior. The need for culturally and linguistically appropriate suicide risk assessment is imperative for deaf populations, and current studies are only beginning to address the needs of these populations. In a mental health setting, deaf individuals may be misdiagnosed as a result of inappropriate or audio-centric instruments or misconceptions by hearing assessors (Black & Glickman, 2006). Additionally, their lack of connection to a community could leave them devoid of the social bonds that provide checks and balances against all

manner of social deviance, including drug use and suicidal behavior. Behaviors that might typically be interpreted as maladaptive later in life may have started as simple communication adaptations. Even when consumers have full command of ASL, miscommunication of symptoms, health history, and other diagnostic data are also common as a result of using an interpreter whose skills and vocabulary may not be specific to mental health and substance abuse treatment.

Most importantly, professionals working with deaf consumers must understand how suicide predictors and diagnoses could be understood differently for this population. Conditions that predispose to suicide may or may not have the same meaning from one culture to the next. Some cultures accept self-damaging behavior as a way of communicating emotions and could be more common in a population that lacks other means of expressing emotional needs or that lacked access to such means during crucial developmental periods in life (Twersky-Glasner, 2006). Mental illness, SUD, culture, and language barriers all make this population one of the most challenging to appropriately assess and accommodate within current models. These issues have been studied as predictors or risk factors of suicidal ideation and attempts, but few consider that they may also be the results of delayed language acquisition that manifest in pathological forms of communication. We propose that this must be considered to construct a more accurate picture of the relationships among language, development, and emotional health. What makes this particularly important for this population is the high percentage of persons with delayed language acquisition and suicidal behavior.

### **Limitations**

This secondary analysis focused specifically on prelingually deaf consumers in SUD treatment, and because there was no control group of deaf individuals without SUD, the effect of the co-occurring SUD on the rates of suicide ideation and attempt is impossible to calculate for this sample. In terms of the measurement of age of language acquisition, self-report is not an ideal way to ascertain that age with confidence. Childhood memories are imprecise, and answers given could be repetition of others' observations. Similarly, those participants with substantially delayed acquisition may have already developed forms of communication that might closely approximate language. Despite these issues, the age of language acquisition variable was sufficient to split the sample into two groups around the age of onset of puberty and the traditional critical period.

The other limitations to this study were the composition of the data

available and sample size. The data was not originally intended to study suicidal behavior and the language assessments were informal. Regardless, the data is too alarming to ignore and justifies the need for additional research in this area. First, future studies should include formal language assessments to more accurately tie this variable to proficiency rather than using the self-reported acquisition age. Second, suicidal behavior data should be gathered using validated instruments that have been adapted and normalized for deaf populations. Third, other assessments that would allow a more detailed examination of mental health variables should be included in future research, and a larger sample would allow for more complex analysis.

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Table 1  
Demographics

	Number (%) of Participants Responding	
	N	%
<b>Gender</b>		
Male	63	58.9%
Female	44	41.1%
<b>Age Group</b>		
18-24	9	8.4%
25-34	23	21.5%
35-44	43	40.2%
45-54	23	21.5%
55-64	7	6.5%
65+	2	1.9%
<b>Race/Ethnicity</b>		
Caucasian	67	62.6%
African American	22	20.6%
Latino	6	5.6%
No response	12	11.2%

Table 2  
Self-reported Suicide Attempts and Suicidal Ideation by Age of Language Acquisition

Suicidal Behavior	Number (%) of Participants Responding		$X^2$	$p$
	Yes	No		
<b>Past Suicide Attempts</b>				
Age of Language <10 Years	34 (38.2)	55 (61.8)	3.22	.063
Age of Language $\geq$ 10 Years	11 (61.1)	7 (38.9)		
<b>Past Suicidal Ideation</b>				
Age of Language <10 Years	42 (47.7)	46 (52.3)	2.14	.114
Age of Language $\geq$ 10 Years	12 (66.7)	6 (33.3)		

Table 3  
Self-reported Suicide Attempts and Suicidal Ideation by Mental Health Diagnosis

Suicidal Behavior	Number (%) of Participants Responding		$X^2$	<i>p</i>
	Yes	No		
<b>Past Suicide Attempts</b>				
Mental Health Diagnosis	30 (62.5)	18 (37.5)	17.14	<.001
No Mental Health Diagnosis	10 (20.8)	38 (79.2)		
<b>Past Suicidal Ideation</b>				
Mental Health Diagnosis	31 (66.0)	16 (34.0)	10.11	<.001
No Mental Health Diagnosis	16 (33.3)	32 (66.7)		

Table 4  
Self-reported Suicide Attempts and Suicidal Ideation by Gender

Suicidal Behavior	Number (%) of Participants Responding		$X^2$	$p$
	Yes	No		
Past Suicide Attempts				
Male	19 (30.2)	44 (69.8)	8.90	.003
Female	26 (59.1)	18 (40.9)		
Past Suicidal Ideation				
Male	26 (41.3)	37 (58.7)	5.82	.016
Female	28 (65.1)	15 (34.9)		

Table 5  
Self-reported Suicide Attempts and Suicidal Ideation for Deaf Men and Women: Summary Data

Suicidal behavior	Number (%) Reporting “Yes”	
	Men	Women
<b>Past suicide attempts</b>		
All participants (with substance abuse disorder)	19 of 63 (30.2)	26 of 44 (59.1)
Participants with reported past mental health diagnosis	14 of 26 (53.8)	16 of 22 (72.7)
Participants with age of language acquisition $\geq 10$ years	6 of 11 (54.5)	5 of 7 (71.4)
Participants with age of language acquisition $\geq 10$ years <i>and</i> reported past mental health diagnosis	4 of 6 (66.7)	4 of 4 (100.0)
<b>Past suicidal ideation</b>		
All participants (with substance abuse disorder)	26 of 63 (41.3)	28 of 44 (65.1)
Participants with reported past mental health diagnosis	16 of 26 (61.5)	15 of 21 (71.4)
Participants with age of language acquisition $\geq 10$ years	6 of 11 (54.5)	6 of 7 (85.7)
Participants with age of language acquisition $\geq 10$ years <i>and</i> reported past mental health diagnosis	4 of 6 (66.7)	4 of 4 (100.0)

Figure 1  
Hypothesized relationship between delayed language acquisition and suicidal behavior.

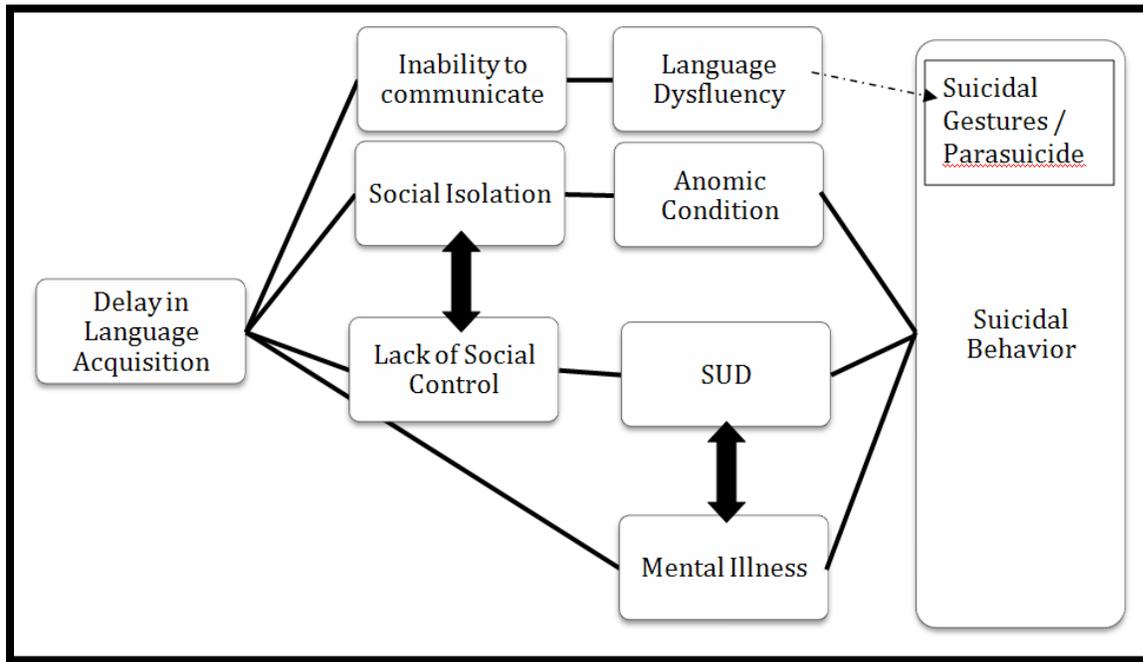


Figure 2  
Distribution of participants by age of first language acquisition.

