MANUSCRIPT UNDER REVIEW

Information safety assurances affect intentions to use COVID-19 contact tracing applications, regardless of autonomy-supportive or controlling message framing

Emma L. Bradshaw[1], Richard M. Ryan[1], Michael Noetel[2], Alexander K. Saeri[3], Peter Slattery[3], Emily Grundy[4], & Rafael Calvo[5]

[1]Institute for Positive Psychology and Education, Australian Catholic University

[2]School of Health and Behavioural Sciences, Australian Catholic University

[3]Monash Sustainable Development Institute, Monash University

[4]School of Psychology, Deakin University

[5]Dyson School of Design Engineering, Imperial College London

Author Note

Emma L. Bradshaw https://orcid.org/0000-0001-6423-5499

Richard M. Ryan https://orcid.org/0000-0002-2355-6154

Michael Noetel https://orcid.org/0000-0002-6563-8203

Alexander K. Saeri https://orcid.org/0000-0001-9254-0300

Peter Slattery https://orcid.org/0000-0002-6083-378X

Emily Grundy https://orcid.org/0000-0002-4059-0311

Rafael Calvo https://orcid.org/0000-0003-2238-0684

Abstract

Promoting the use of contact tracing technology will be an important step in global recovery from the COVID-19 pandemic. The current study assesses two messaging strategies as motivators of contact tracing use. In a sample of 1117 Australian adults (M_{age} = 50.17, SD_{age} = 17.46) we examined autonomy-supportive and controlling *message framing* and the presence or absence of *information safety* as predictors of intended contact tracing application uptake. Using an online randomized experimental design, we found that autonomy-supportive and controlling message framing did not differentially affect intended uptake. However, there was a main effect of information safety. Those in high information safety conditions reported higher intentions to use the application and to recommend it to others than those in low information safety conditions, regardless of message framing. In these unprecedented circumstances, Australians appeared more willing to assent to authority regarding contact tracing insofar as their data safety can be assured.

Keywords: Coronavirus, autonomy, information security, track tracing, self-determination theory

As countries around the world "flatten the curve" of COVID-19 infections, so too they will begin to relax the various social distancing measures put in place to slow the spread. As restrictions ease, an effective way to slow the spread may be to trace the contacts of people who are COVID-19 positive, and test those contacts. The process typically involves laboriously interviewing the infected person to identify possible contacts. Contact tracing can rapidly accelerate this process. With contact tracing, people can use software on their mobile devices to track their recent contacts. Health professionals can then use the software to notify those who have been in close contact with a newly infected person, so those at risk can get tested or self-isolate. However, the effectiveness of the application will be commensurate with its community uptake. If very few people use the technology, its effectiveness is greatly compromised. Therefore, understanding how to best motivate use of contact tracing applications is of vital importance to the process of recovering from the COVID-19 pandemic. *Self-determination theory* (SDT; Ryan & Deci, 2017) provides a parsimonious and evidence-based framework for understanding how the framing and content of social messages can motivate or undermine behavior change.

Evidence from SDT finds that environments that support feelings of meaning, volition, and choice—that is, environments that support autonomy—facilitate the internalization of ambient values (Nishimura, Bradshaw, Ryan, & Deci, 2020; Ryan & Deci, 2017), and can promote positive, healthy decision making (Williams et al., 2006). In contrast, when people feel subject to external controls or inductions that are controlling, individuals often show less willingness to adopt or maintain the target behaviors (DeCaro & Stokes, 2008; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005) and may even reject imposed values (Hawley, Little, & Pasupathi, 2002). Indeed, the provision of autonomy-support has been meta-analytically linked to greater sense of value for and adherence to a host of health-related behaviors over time (Gillison, Rouse, Standage, Sebire, & Ryan, 2019; Ntoumanis et

al., 2020). In this study, we experimentally manipulate two elements of social messaging expected to impact people's willingness to download a COVID-19 contract tracing application. The first strategy uses an autonomy-supportive versus controlling message framing to promote use of the application; the second uses messaging inferring high or low levels of information privacy, non-surveillance, and safety.

Autonomy-supportive versus controlling framing. It is well established that prolonged exposure to autonomy-support and control influences behavior (Ng et al., 2012; Slemp, Kern, Patrick, & Ryan, 2018). However, the effect of autonomy-supportive and controlling social messages on promoting new behaviors has been less researched. Some prior research suggests that autonomy-supportive messages may be more persuasive than messages framed with controlling language (Legault, Gutsell, & Inzlicht, 2011). Autonomy-supportive messages provide a meaningful rationale for a recommendation and minimize feelings of pressure by emphasizing individual choice (e.g., Jang, 2008) thereby promoting behavior endorsement due to identified value, rather than external pressure (Ryan & Deci, 2017; Vansteenkiste et al., 2018). In contrast, messages with a controlling framing attempt to induce feelings of guilt or pressure by using words like "should" and "must", which can diminish individuals' feelings of agency, often resulting in resistance to or even defiance of the message (Legault et al., 2011). In sum, autonomy-supportive message framing may allow individuals to better identify with messaging goals, thereby increasing the likelihood of adherence to recommendations relative to controlling messages. In the context of COVID-19 tracing applications, uptake should thus be more encouraged by autonomy-supportive than by controllingly-framed messages.

Information Safety and Concerns with Surveillance. Although the potential utility of contact tracing is self-evident, the use of such technologies also raises other issues regarding autonomy, most notably the potential for surveillance and fears of loss of control of

personal information (Calvo, Deterding, & Ryan, 2020). Indeed, past studies show that

experiences of surveillance can undermine a sense of autonomy and decrease motivation for

behavior (e.g., Enzle & Anderson, 1993; Plant & Ryan, 1985). Concerns about the storage

and use of data collected by COVID-19 contact tracing applications may thus lead to lower

adoption if potential users cannot be assured that their activities will not be surveilled for

other purposes and that their data is fully protected. We thus expect that making data safety

assurances salient will result in greater intention to uptake the application, relative to a

condition where data protection is less transparent or guaranteed.

Interaction Effects. Data safety assurances are important in promoting public health

compliance because such declarations map on to people's inherent need to feel

psychologically safe and free from government surveillance and control (Calvo et al., 2020).

In addition, data safety relates to perceptions of authority as being legitimate and trustworthy,

and perceived legitimacy of authority is related to autonomy-support (Ryan & Deci, 2017).

For example, Graça, Calheiros, and Barata (2013) showed that adolescents' deference to

teacher authority and willingness to follow rules was higher when the teacher was perceived

as generally autonomy-supportive. Therefore, we also expect that a combination of

autonomy-supportive message framing and high information safety will especially promote

contact tracing uptake. Testing these hypotheses is the central goal of the ensuing study.

The Current Research

In this study, using a large sample of Australian adults, we examined three primary

effects: 1) The impact of autonomy-supportive and controlling message framing in promoting

positive perceptions of, and intentions to use, a contact tracing application; 2) The impact of

information safety messages in promoting positive perceptions of, and intentions to use, a

contact tracing application; and 3) The interaction between message framing and information

safety in promoting positive perceptions of, and intentions to use, a contact tracing

application. Using a 2 x 2 factorial analysis of covariance (ANCOVA) we expected to find a main effect of *message framing*, such that participants in the autonomy-supportive conditions reported more positive perceptions of the application than those in the controlling groups. Similarly, we expected to find a main effect of *information safety*. Specifically, we expected participants in the high information safety condition to be more in favor of the application than those in the low information safety condition. The hypotheses for this study were preregistered on the Open Science Framework [view-only link suitable for anonymized peer review: https://osf.io/q7mju/?view_only=34b094cae1aa457995965bbb5857dc5e].

Method

Participants

The sample comprised 1117 Australian adults, recruited by a professional panel company. The range of the sample was 18 to 89 (*M*=50.17, *SD*=17.46).

Materials

Our study materials were presented with a battery of other items for the purposes of separate studies. We did not refer to nor preregister hypotheses related to the other variables in the study and so do not mention them here. More details about the complete questionnaire battery can be found here [anonymized link available here: https://osf.io/u5x3r/?view_only=b6d5f082db2b4eb4a7890bf6826cfb43].

Pre-Test Items

Likelihood of Using the Application. We expected that participants' initial likelihood of downloading a contact tracing application would be a substantial predictor of post-test intentions to download. Therefore, to control for initial intentions we posed the question "How likely are you to download and install a government COVID-19 tracing app on my phone?". The item was responded to on a 0 (not at all likely) to 10 (extremely likely) scale.

Post-Test Items

Perceptions of Contact Tracing Applications. We posed three post-test questions to assess participants' perceptions of a COVID-19 contact tracing application: 1) How likely would you be to download and install a COVID-19 tracing app? (0 = not at all likely - 10 = extremely likely); 2) Do you think a COVID-19 tracing app is a good idea for your government to fund? (0 = extremely bad idea - 10 = extremely good idea); and 3) How likely is it that you would recommend a COVID-19 tracing app to a friend, family member, or colleague? (0 = not at all likely to recommend - 10 = extremely likely to recommend). We also presented participants with five additional questions related to their valuing of the application, trust for the application, perceived usability of the technology, and their self- or other-focused reasons for using the application. However, we did not pre-register these hypotheses, so we present these items in Online Supplementary Materials S2 and their correlations with the rest of the study variables in Online Supplementary Materials S3.

Experimental Manipulation

Following the reporting of pre-test measures, participants were randomly assigned to one of four conditions: autonomy-support with high information safety (*n*=268), autonomy-support with low information safety (*n*=262), control with high information safety (*n*=303), and control with low information safety (*n*=284). Participants were naïve to their condition as were experimenters because the study was conducted online. All participants were presented with the same introduction, followed by a condition-specific combination of two of four vignettes (included in Online Supplementary Materials S1). The autonomy-support and control vignettes were word count-matched at 128 words each, as were the information is safe and information is not safe conditions at 84 words each.

Results

Preliminary Analysis

All analyses were conducted in R Version 3.6.0 (R Core Team, 2019), using packages including dplyr (Wickham, Francois, Henry, & Müller, 2019), corx (Conigrave, 2019), and psych (Revelle, 2017). Means, standard deviations, and inter-correlations between the study variables are included below in Table 1. As we expected, pre-test intention to download a COVID-19 contact tracing application correlated strongly with post-test intentions, and positive post-test perceptions of a contact tracing application were sensibly positively associated. Correlations reported in Online Supplementary Materials S2 and S3 demonstrate that seeing value in the application, trusting its safety, and seeing it as beneficial to oneself and to others, were all strongly positively correlated with intention to download and use the application across conditions.

There were no differences across the four groups in either pre-test likelihood of downloading the application, $F(3, 1111)=1.09$, $p=.35$, $\eta_p^2 = 0.003$, or in mean age, $F(3, 1113)=0.13$, $p=.95$, $\eta_p^2 = 0.00$. The small number of participants who did not respond to all items (range from 0.18% to 1.97% missing responses across the pre- and post-test variables) were omitted from the relevant analyses.

Table 1.

Inter-correlations, means, and standard deviations for the study variables

	1	2	3	4
1. Pre-test likelihood of downloading	-			
2. Post-test intention to download	0.79***	-		
3. Post-test government should fund	0.61***	0.77***	-	
4. Post-test recommend to others	0.68***	0.85***	0.81***	-
Mean	3.96	4.60	5.85	4.94
SD	3.49	3.57	3.05	3.38

*Note. *$p < .05$, **p $< .01$, ***$p < .001$.

Primary Analysis

To test if the total participant reports of likelihood of downloading the COVID-19 contact tracing application increased from pre- to post-experiment, we conducted a *t*-test, which indicated the intention to download increased from pre- to post-experiment, $t(2226.90)=-4.31$, $p < .001$ [95% CI -0.94, -0.35] (see Table 1 for means and standard deviations). Next, to examine group differences on the post-experiment measures, we ran three 2 x 2 factorial ANCOVAs using the two (message framing and information safety) two-level (autonomy vs. control and high information safety vs. low information safety) factorial predictors. First, we predicted post-test intention to download the application. Second, we predicted post-test perceptions of the application as a worthwhile use of government resources. Third, we predicted post-test intention to recommend the application to friends and family. In all three models, we controlled for self-rated initial likelihood of downloading the application.

Autonomy-Supportive Versus Controlling Message Framing. The experimental group-specific means presented in Table 2, coupled with the 2 x 2 factorial ANCOVA results shown in Table 3, demonstrate that there was no statistically significant effect of message framing on any of the three dependent variables.

High Information Safety Versus Low Information Safety. Table 3 shows a statistically significant effect of information safety on two of the three outcomes: intention to download the application and intention to recommend the COVID-19 contact tracing application to friends, family, and colleagues. According to the means in Table 2, participants in the two high information safety conditions reported higher intentions to download and to recommend it than those in the two low information safety conditions. There was no effect of information safety on perceptions of the application as a worthwhile use of government resources.

Interaction Between Message Framing and Information Safety. As shown in

Table 3, there were no statistically significant interactions between message framing and

information safety in the prediction of any outcomes. The effect of information safety was

evident regardless of autonomy-supportive or controlling message framing.

Table 2.

Experimental group-specific means and standard deviations for the pre-test and post-test measures

	Aut + Safe	Aut + Not Safe	Cont + Safe	Cont + Not Safe
Pre-test likelihood	3.84 [3.40]	3.72 [3.41]	4.01 [3.56]	4.23 [3.56]
Post-test intentions	4.71 [3.42]	4.24 [3.48]	4.86 [3.65]	4.55 [3.68]
Post-test support	5.97 [2.92]	5.68 [2.98]	5.90 [3.05]	5.84 [3.25]
Post-test recommend	5.04 [3.18]	4.46 [3.46]	5.26 [3.41]	4.95 [3.43]
Pre-post difference	0.88 [2.49]	0.52 [2.34]	0.85 [2.20]	0.32 [2.15]

Note. Aut = autonomy-supportive message framing condition; Cont = controlling message framing condition; Safe = information is safe condition; Not Safe = information not safe condition; Pre-test likelihood [to download the application]; Post-test intentions [to download the application]; Post-test support [the government investing in the application]; Post-test recommend [the application to friends, family, and colleagues]; Pre-post difference = Post-test intentions minus pre-test likelihood.

Table 3.

Results from a 2 x 2 factorial ANCOVA, using message framing and information safety to predict post-test perceptions of a COVID-19 contact tracing application, controlling for pre-test likelihood to download

	Sum of Squares	df	Mean Square	F	p	η_p^2
Intention to download						
Pre-test likelihood	8808.20	1	8808.20	1833.54	< .001	0.62
Message framing	0.50	1	0.50	0.10	0.75	0.00
Information safety	54.6	1	54.6	11.38	0.001	0.01
Message framing * Info Safety	0.70	1	0.70	0.15	0.70	0.00
Residuals	5327.50	1109	4.80			
Government should fund						
Pre-test likelihood	3826.20	1	3826.20	657.15	< .001	0.47
Message framing	5.30	1	5.30	0.91	0.34	0.00
Information safety	10.70	1	10.70	1.85	0.18	0.01
Message framing * Info Safety	0.00	1	0.00	0.01	0.93	0.00
Residuals	6346.50	1090	5.80			
Recommend to others						
Pre-test likelihood	5904.30	1	5904.30	975.13	< .001	0.38
Message framing	5.30	1	5.30	0.88	0.35	0.00
Information safety	65.40	1	65.40	10.80	0.001	0.01
Message framing * Info Safety	0.00	1	0.00	0.004	0.95	0.00
Residuals	6660.30	1100	6.1			

Discussion

Our evidence suggests that data and information safety assurances may be vital tools in promoting the uptake of COVID-19 contact tracing applications. The broad aim of this study was to assess two elements of social messages, and their effects on people's intentions to abide government requests to use contact tracing technology. We found support for our hypotheses regarding information safety, but did not find an effect of message framing or an interaction between information safety and message framing. Participants in the two message framing conditions (autonomy-support and control) did not differ on any outcome. Meanwhile, individuals in the high data safety conditions reported a greater likelihood of downloading the application and of recommending it to friends and family, compared to

those in the low information safety conditions. However, information safety did not affect people's perceptions of the COVID-19 tracing application as a worthwhile use of government resources. The effects of information safety assurances were evident regardless of message framing condition.

Of course, we would be remiss if we did not emphasize that messages about data security should be anchored in truth. If the public is assured that personal data are safe, the information needs to actually be protected. We would expect that if information safety messages originated from an untrustworthy government or entity, the ability of the message to instigate behavior change would likely be nullified. Indeed, perceived legitimacy may account for our null finding regarding autonomy-supportive and controlling message framing. In Australia, where the sample was collected, compliance with government requests has been high. Arguably, in these unprecedented times the public are placing trust in government bodies, and insofar as the number of COVID-19 infections and deaths has effectively decreased within Australia, government authority may appear legitimate, and thus inspire a "willing assent" to its recommendations (Ryan & Deci, 2017). That is, given that the COVID-19 contact tracing application is government endorsed, perhaps people are willing to accept the advice regardless of the message framing.

It is also the case that our survey was administered proximal to the actual launch of Australia's contact tracing application COVIDsafe. We collected data over a 72-hour period basing the application description on contemporaneous media reporting and government press conferences. Three days after the data were collected, the government actually released the application and encouraged Australians to download it. Thus, participants likely had extensive exposure to the government's aims and rationale. In addition, all conditions were provided with a description of the application, including how it can accelerate contact tracing. Given all groups increased their willingness to use the application, the description may have

provided all participants with a self-evident, value-aligned rationale. Ancillary correlations reported in Online Supplementary Materials S2 and S3 demonstrated that people's willingness to engage with contact tracing technology was strongly associated with the belief that a contact tracing application has value, is safe, and would benefit both self and others. Nonetheless, our conditions making information safety explicit enhanced participants' willingness to use the application.

Important to note is that behavior can be initiated for both autonomous *and* controlled reasons, and in the present study, results showed that, when paired with safety reassurances, participants exposed to *either* autonomy-supportive or controlling message framings increased in their intention to engage with contact tracing technology. Sources of external pressure, or feelings of internal pressure like guilt and shame can effectively motivate short-term behaviors (Pelletier, Fortier, Vallerand, & Briere, 2001). Where such controlled forms of motivation tend to lack efficacy is in their ability to sustain behavior change over the long-term (Ng et al., 2012; Ryan, Patrick, Deci, & Williams, 2008). Therefore, it would be useful to examine the effects of autonomy-supportive and controlling message framing on the maintenance of behavior change longitudinally, especially with hard to sustain behaviors such as social distancing or frequent hand washing.

The current study could also be meaningfully expanded. Our use of an Australian sample is a potential limitation because social and media discussion regarding contact tracing applications had been widespread for several weeks prior to our study. Thus, participants' views of the technology had likely already, at least partially, developed. Accordingly, replication and expansion of this study in a country that is yet to consider contact tracing technology may be more appropriate for testing our hypotheses. Moreover, as we argued above, the Australian public is reporting increasing endorsement of government policies and showing high levels of compliance, which may account for our null message framing effect.

Use of these experimental materials in a country with less government approval and compliance would thus be informative.

Taken together, the current pattern of results suggests that the provision of data safety may be key in affecting people's future use of contact tracing technology for COVID-19, an effect we found regardless of whether messaging was framed in an autonomy-supportive or controlling manner. These findings thus highlight the importance of transparency in source codes, and explicit protections regarding data accessibility, to ameliorate concerns with controlling surveillance in implementing such potentially life-saving technologies. Testing these findings in samples from countries with less pervasive discourse about contact tracing and with lower perceived legitimacy of authority may be important in establishing the generalizability of these findings. Questions regarding the ability of brief social messages to affect behavior is more crucial now than it has ever been, and we hope to spur more research examining these effects.

Acknowledgements

References

Calvo, R. A., Deterding, S., & Ryan, R. M. (2020). Health surveillance during COVID-19 pandemic. *369*, m1373. doi:https://doi.org/10.1002/jclp.22750

Conigrave, J. H. (2019). corx: Create and format correlation matrices (Version R package version 1.0.2). Retrieved from https://cran.r-project.org/package=corx

DeCaro, D., & Stokes, M. (2008). Social-psychological principles of community-based conservation and conservancy motivation: Attaining goals within an autonomy-supportive environment. *Conservation Biology, 22*(6), 1443-1451. doi:https://doi.org/10.1111/j.1523-1739.2008.00996.x

Enzle, M. E., & Anderson, S. C. (1993). Surveillant intentions and intrinsic motivation. *Journal of Personality and Social Psychology, 64*(2), 257-266. doi:https://doi.org/10.1037/0022-3514.64.2.257

Gillison, F. B., Rouse, P., Standage, M., Sebire, S. J., & Ryan, R. M. (2019). A meta-analysis of techniques to promote motivation for health behaviour change from a self-determination theory perspective. *Health Psychology Review, 13*(1), 110-130. doi:https://doi.org/10.1080/17437199.2018.1534071

Graça, J., Calheiros, M. M., & Barata, M. C. (2013). Authority in the classroom: Adolescent autonomy, autonomy support, and teachers' legitimacy. *European Journal of Psychology of Education, 28*(3), 1065-1076. doi:https://doi.org/10.1007/s10212-012-0154-1

Hawley, P. H., Little, T. D., & Pasupathi, M. (2002). Winning friends and influencing peers: Strategies of peer influence in late childhood. *International Journal of Behavioral Development, 26*(5), 466-474. doi:https://doi.org/10.1080/01650250143000427

Jang, H. (2008). Supporting students' motivation, engagement, and learning during an

　　uninteresting activity. *Journal of Educational Psychology, 100*(4), 798-811.

　　　doi:https://doi.org/10.1037/a0012841

Legault, L., Gutsell, J. N., & Inzlicht, M. (2011). Ironic effects of antiprejudice messages:

　　How motivational interventions can reduce (but also increase) prejudice.

　　Psychological Science, 22(12), 1472-1477.

　　　doi:https://doi.org/10.1177/0956797611427918

Ng, J. Y., Ntoumanis, N., Thøgersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., &

　　Williams, G. C. (2012). Self-determination theory applied to health contexts: A meta-

　　analysis. *Perspectives on Psychological Science, 7*(4), 325-340.

　　　doi:https://doi.org/10.1177/1745691612447309

Nishimura, T., Bradshaw, E. L., Ryan, R. M., & Deci, E. L. (2020). *Satisfaction of basic*

　　psychological needs in an interdependence model of fathers' own aspirations and

　　those of their adolescent children.

Ntoumanis, N., Ng, J. Y., Prestwich, A., Quested, E., Hancox, J. E., Thøgersen-Ntoumani, C.,

　　. . . Williams, G. C. (2020). A meta-analysis of self-determination theory-informed

　　intervention studies in the health domain: effects on motivation, health behavior,

　　physical, and psychological health. *Health Psychology Review*, 1-31.

　　　doi:https://doi.org/10.1080/17437199.2020.1718529

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., & Briere, N. M. (2001). Associations among

　　perceived autonomy support, forms of self-regulation, and persistence: A prospective

　　study. *Motivation and Emotion, 25*(4), 279-306.

　　　doi:https://doi.org/10.1023/A:1014805132406

Plant, R. W., & Ryan, R. M. (1985). Intrinsic motivation and the effects of self-

　　consciousness, self-awareness, and ego-involvement: An investigation of internally

controlling styles. *Journal of Personality, 53*(3), 435-449. doi:https://doi.org/10.1111/j.1467-6494.1985.tb00375.x

R Core Team. (2019). R: A language and environment for statistical computing (Version 3.6.0). Vienna, Austria: R Foundation for Statistical Computing.

Revelle, W. R. (2017). psych: Procedures for personality and psychological research (Version R package version 1.8.12). Retrieved from https://cran.r-project.org/package=psych

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. New York, NY: The Guilford Press.

Ryan, R. M., Patrick, H., Deci, E. L., & Williams, G. C. (2008). Facilitating health behaviour change and its maintenance: Interventions based on self-determination theory. *European Health Psychologist, 10*(1), 2-5.

Slemp, G. R., Kern, M. L., Patrick, K. J., & Ryan, R. M. (2018). Leader autonomy support in the workplace: A meta-analytic review. *Motivation and emotion, 42*(5), 706-724.

Vansteenkiste, M., Aelterman, N., De Muynck, G.-J., Haerens, L., Patall, E., & Reeve, J. (2018). Fostering personal meaning and self-relevance: A self-determination theory perspective on internalization. *The Journal of Experimental Education, 86*(1), 30-49. doi:https://doi.org/10.1080/00220973.2017.1381067

Vansteenkiste, M., Simons, J., Lens, W., Soenens, B., & Matos, L. (2005). Examining the motivational impact of intrinsic versus extrinsic goal framing and autonomy-supportive versus internally controlling communication style on early adolescents' academic achievement. *Child Development, 76*(2), 483-501. doi:https://doi.org/10.1111/j.1467-8624.2005.00858.x

Wickham, H., Francois, R., Henry, L., & Müller, K. (2019). dplyr: A grammar of data manipulation (Version R package version 0.8.3). Retrieved from https://cran.r-project.org/package=dplyr

Williams, G. C., Lynch, M. F., McGregor, H. A., Ryan, R. M., Sharp, D., & Deci, E. L.

(2006). Validation of the" Important Other" Climate Questionnaire: Assessing

autonomy support for health-related change. *Families, Systems, & Health, 24*(2), 179-

194. doi:https://doi.org/10.1037/1091-7527.24.2.179